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АНГЛИЙСКИЙ ЯЗЫК

Практикум
по курсу «Письменный перевод»
для слушателей специальности 1-21 06 74
«Современный иностранный язык
(социально-экономическая
и научно-техническая деятельность)»
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Цель практикума – развивать умения и навыки чтения оригинальной литературы по специальности, а также умения выполнять различные виды письменного перевода и текстовой обработки оригинальных текстов, а именно: полный письменный перевод, реферативный перевод, перевод «экспресс-информация», аннотационный перевод, составление сообщений, а также устный перевод с листа.

Для слушателей специальности 1-21 06 74 «Современный иностранный язык (социально-экономическая и научно-техническая деятельность)» вечерней формы обучения.

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Раздел I. ИНФОРМАЦИОННЫЕ ТЕХНОЛОГИИ

Текст 1
Cyberspace – a New Medium

In my book, Cyberspace: First Steps, I define cyberspace as a globally networked, computer-sustained, computer-accessed, and computer-generated, multidimensional, artificial, or "virtual" reality. In this reality, to which every computer is a window, seen or heard objects are neither physical nor, necessarily, representations of physical objects but are, rather, in form, character and action, made up of data, of pure information. This information derives in part from the operations of the natural, physical world, but for the most part it derives from the immense traffic of information that constitutes human enterprise in science, art, business, and culture.

The dimensions, axes, and coordinates of cyberspace are thus not necessarily the familiar ones of our natural, gravitational environment: though mirroring our expectations of natural spaces and places, they have dimensions impressed with informational value appropriate for optimal orientation and navigation in the data accessed.

In cyberspace, information-intensive institutions and businesses have a form, identity, and working reality-in a word and quite literally, an architecture-that is counterpart and different to the form, identity, and working reality they have in the physical world. The ordinary physical reality of these institutions, businesses, etc. as seen as surface phenomena, as husks, their true energy coursing in architectures unseen except in cyberspace.

So too with individuals. Egos and multiple egos, roles and functions, have a new existence in cyberspace. Here, no individual is appreciated by virtue only, if at all, of their physical appearance, location, or circumstances. New, liquid, and multiple associations between people are possible, for both economic and non-economic reasons, and new modes and levels of truly interpersonal communication come into being.

Cyberspace, I say, has a geography, a physics, a nature, and a rule of human law. In cyberspace the common man and the information worker - cowboy or infocrat - can search, manipulate, create or control information directly: he can be entertained or trained, seek solitude or company, win or lose power-indeed, can "live" or "die" as he will.

Текст 2
The Individual in the Information Society

New business areas will open up with digitization. Since this will involve both the processing and the new presentation of information, this will certainly also be approached using previous criteria. With distance learning many things will change, and from early in a person's life. A major portion of the knowledge that must be learned will be assimilated on an individual basis, that is, outside the classroom. With the aid of CD-ROM and PC, it will be possible to independently master the knowledge passed on in grade school, high school and at university. This doesn't mean that schools or universities as the site of pedagogical training and socialization will lose their grounds for existence, but rather that instead of continuing the uninspired learning process that currently takes place there, students will exchange the knowledge that they have already mastered. The working world, too, will gain in quality through distance working or telecommuting. In place of congested areas of job concentration in the big cities, with their enormous streams of commuters clogging the roads every morning and evening, and the resulting environmental burden, it will be possible to create a geographic distribution of job opportunities. Some professions, such as that of journalist, are very well suited for this-all that is required is a fax and a PC. Services such as telephoning, telebanking and many others will make daily living easier and lead to greater efficiency.

The possibility of getting in contact via on-line services with people who share one's own interests will definitely promote the development of "Affinity Groups". Already hundreds of thousands of the Internet's more than 30 million users are exchanging information on special topics on the Net every day. The Information Society will consist of a multitude of such affinity groups and will represent a broad spectrum of interests. It will be possible to have almost unlimited access to everyone. Thanks to Interworkshop, small and medium-sized companies will benefit from having access to the same wealth of information that until now has only been available to large corporations. However, decentralization into small units will permit these units to act globally once more. Culture and knowledge, and especially research and the arts, will experience dimensions in international exchange. The last, old boundaries will fall before the onslaught of the digital revolution. Politics and government will become more transparent; elections and citizens' referenda using on-line services will become an everyday occurrence.

Текст 3
Computers Bestow Power

Information technology will affect political life the way it has affected every other sphere of human existence. Will it be an instrument in the service of democracy, and if so, in what way? The universal dissemination of information without a natural center of gravity, or epicenter, also entails a fragmentation of social and cultural life. In this aspect, democracy as a universal and shared communal discourse may disappear. What will come in its place? On the other hand, the public life, a concept introduced long ago by August Strindberg, will find it much more difficult to take root in a society in which information is disseminated without let or hindrance. In an information-based society, it will be impossible to accept a single model of reality shaped by some central power source.

Someone else pointed out that the global dissemination of information may, on the other hand, have a negative influence on the credibility of information. It is possible to disseminate disinformation or pure propaganda, and doubts will grow as to the reliability of the information provided, the interests it is serving, and whether it has any genuine relevance. These questions may be difficult to resolve if instruments of evaluation are lacking. The potential for action and the possibility of destroying existing hierarchies, available to anyone equipped with a computer, will be tremendous. Will we able to harness this power? What other instruments will be needed for every man to be able to exploit the inherent potential of information technology?

On the other hand, information technology provides us with immense opportunities for disseminating vast quantities of information. Do people have the capacity to digest the whole of this flood of information? How will people be able to appropriate and assimilate the information? What basic skills are required to be able to select adequate information and then digest it? Thus, the increasing availability of more information in society does not automatically imply that every citizen will be better informed. Perhaps the relentless stream of information will contribute to an even greater degree of segregation in the community. People mat be divided into those with the opportunities, knowledge and motivation to appropriate the free flow of information, and those lacking the capacity, will or skills to do so. The latter group will be excluded. The question cannot be answered until a vision of the information-based society of the future has been formulated. Such a vision is necessary in order to provide an orientation for our journey through future worlds, both real and virtual.

Текст 4
Transition in the User's Role

In most cases during the evaluation stage, you, as a manager or a key member of the development team, will change the role that you play with regard to the project. You will become more of a manager or overseer and less of a doer. To this point, the discussion has assumed that you will have a key role in developing the workgroup MIS (Management Information Systems). With regard to the definition and requirements stages, this is probably accurate. Even if you, yourself, do not perform the work of these stages, then someone in your employ, or, someone to whom you are close, will undoubtedly perform this work. And, in any case, you will be wise to stay abreast of the project in these critical stages.

However, most non-information systems professionals have neither the time nor the expertise to continue to develop the workgroup MIS beyond these stages themselves. Once the project enters the design and implementation stages, the system will begin to involve expertise that is probably not worth your while to obtain. The project may also involve expertise that requires more time to obtain than you have, even if you think that attaining it might be worthwhile. Consequently, most users do not play a substantial role in the work of designing and implementing a workgroup MIS. Instead, they manage that activity by providing guidance and direction and by approving the initiation of work and the disbursement of funds. This fact is a key difference between the development of a personal MIS and the development of a workgroup MIS. With a personal MIS, you may perform your own design and implementation. For a spreadsheet application, for example, it is reasonable to suppose that you would select the hardware and software yourself, learn how to use the software, design your own file directories, and build and implement your own spreadsheet applications. With any but the simplest workgroup MIS, this is too much to expect of yourself. Attempting to build such a system yourself changes your job expectations to those for an information systems professional instead of those for a business professional in some non-MIS discipline.

Thus, when developing a workgroup MIS, you will most likely employ some person or group from outside your department to design and implement your system. This group might be composed of employees from the MIS department of your own corporation, an outside contractor, or both. It is during the evaluation stage that you make this key transition. Up to this stage, you and your department are the possessors of the expertise.

You (and your department) know the problem: You know what is, and you know what should be. You know what output you need, you know what data is available, and so forth. No one from outside your group can or does have this expertise.

Текст 5
Microelectronics

The first transistor came into existence in 1948. Today we can buy a memory chip capable of storing 4 million bits of information on 1 cm2 of silicon. Each individual transistor has minimum features of about one half micron or millionth of a meter. In industrial research laboratories ongoing development will increase storage capacity by further reducing the dimensions of the individual transistor. Development to date now has been very predictable and it is probably safe to predict that some time between 2000 and 2010 we will be able to buy memory chips with a capacity of 1 billion bits (1 Gb). The market price of such chips will most likely fall to less than 10 US dollars. To get an idea of the practical storage capacity of such chips, consider a circuit board with one hundred 1 Gb chips. This board would have a surface area of a few dm2. The storage capacity of such a board would be equivalent to about 1km of shelf space filled with books or sufficient to store several films. The difference between this type of memory and the magnetic or optical memories already in use lies in the access speed and the possibility of multiple accesses provided by the chip memories. It would be possible, for example, for several TV viewers to look at the same film simultaneously on different TV sets and start their viewing at different times. This multiple high speed access to the data bases of the future opens up tremendous possibilities.

The same technology used in memory chips is also used to build processors for computers. The 1 Gb per chip technology generation makes it possible to build palm-sized computers with the same capacity as the largest supercomputers available today. Chip technology is also used to build the electronics used in the radio links which form the basis for mobile telephones. More potent chips will offer smaller size, lower power consumption (and thus longer battery life), more communication channels by using higher frequencies and lower cost. Thanks to such developments, it is reasonable to predict a development where all kinds of terminals such as telephones, video phones, computers, telecopiers, cash registers instruments, etc., will be cordless. Specialized chips are already used to

monitor and govern industrial equipment to reach even higher levels of automation. New types of cheap miniaturized microelectronic sensors are also being developed. We already have the electronic eye or the sensor chip used in commercial TV cameras. Similar sensors capable of night vision are emerging. Also other human sensors can be emulated in, for example, “electronic noses”, advanced microphones, etc. Thin film transistors built on the back of glass plates containing liquid crystals are already coming into use as displays, and undoubtedly the next one or two decades will give us high resolution multicolor flat panel displays of almost any size. The current generation of printers based on small semiconductor laser chips will similarly be perfected. High-speed printers with color quality and resolution equal to the art reproductions of today seem very likely to emerge within a decade or two.

An optical fiber is a 0.1 mm diameter cylindrical quartz glass fiber with a central core of 0.01 mm capable of conducting infrared light almost without attenuation. Only 50 percent of the light is lost over 30 km of transmission length, which makes transmission possible over very large distances without any electronic repeaters. The information transmission capacity of such fibers is enormous. To further enhance communication capacity, development is focusing on the use of several light frequencies or “color” simultaneously. Each “color” constitutes its own information channel. Using this technique a total capacity per fiber of 1,000 Gb/s would seem to be possible. A single optical cable could contain as many as 100 fibers. The optical cable does not look very different or differ much in size from the power cable to an ordinary desk lamp and could have a total capacity of 105 Gb/s. This communication capacity is sufficiently high to have one half of the current population of the world at one end of the cable talking to the other half at the other end. All simultaneously!

Текст 6
Office Automation Systems (OAS)

The fourth type of information system we will discuss is the office automation systems (OAS). OAS are information systems that create, store, modify, display, and communicate business correspondence, whether in written, verbal, or video form. The prevalence of microcomputers in the office, along with a veritable explosion in new communications, computer, and storage products, is causing fundamental changes in the ways that offices conduct their business. Ay first, computer systems were used just

for stand-alone word processing. Over time, however, computers were connected to one another. This connection allowed users not only to share word processing files, but also to send messages to one another. Today a wide variety of different OAS systems exist.

With electronic mail systems, office personnel generate and send messages to one another. Also since office workers can access the same files, electronic bulletin boards have been created. These files are essentially electronic posts on which people can leave public messages. All of these capabilities have become more exciting as the technology has developed to include high-quality graphics in the messages. Additionally, facsimile machines have been improved and reduced in cost, so that documents containing text, illustrations, and graphics can be inexpensively communicated over telephone lines. In parallel with these developments, computer technology has improved office voice systems. Such systems allow organizations to develop voice mail system that support not only sophisticated systems of voice mail, but also flexible call-forwarding, telephone conferences, and the like.

In addition, companies in document-intensive industries such as insurance have developed image-processing systems in which documents are scanned to produce an electronic image. One insurance company asserts that it creates an electronic image of every document that it receives. Each image is coded with date, time, critical numbers (such as customer numbers, invoice numbers, and the like), and the comments. This system enables the organization to rapidly access all correspondence. For example, when a customer calls regarding an insurance claim, the claims agent is able to electronically access all data and correspondence about that claim.

Collaborative writing systems have also been developed. These systems enable groups of people to work together, in parallel, in the development of documents. A typical example is a group of people working together to produce a proposal. Individuals use the collaborative writing system both to contribute their work to the group's effort and to access the work of others as it is developed.

Finally, video systems are expanding in their applications. Large organizations use video-conferencing capabilities so that people can communicate face-to-face without traveling. At first, such capabilities were used to connect a few executives in two or three locations. Recently, however, such systems have been used to connect thousands of people to the same presentation. Most of these systems have been developed in isolation

from each other. Systems that provide integrated OAS capability are under development. Such systems will provide documents and messages that are composites of OAS capabilities. The U.S. Army, for example, is developing a system to integrate text, drawings, images, and data into electronic documents. Such documents would not exist physically at any one site. Instead, they would be created on demand; the data that constitutes any given document would be assembled from many different sites.

Текст 7
Programs

Computers are general-purpose devices. In order to cause the computer to execute specific tasks, a program of instructions is loaded into system memory. This program directs the general- purpose computer hardware to accomplish specific tasks. This section presents a description of the major types of programs and describes the essential concepts of programming languages that you, as a future business professional, need to know.

Although hundreds of different computer programs exist, they can be grouped into two major groups: Systems programs and applications programs. System programs are the closest to the hardware; they control the computer's resources and allocate those resources to other programs on request. Systems programs supervise the activity of other programs. They are general purpose and are not tailored to any particular application. Application programs invoke resources of systems programs to accomplish tasks specific to a particular need. There are three major categories of application programs.

First, horizontal market applications provide a generalized capability that is of use to a wide variety of individuals and organizations. Word processing programs and spreadsheet programs are examples of horizontal market applications. The term 'horizontal' is used because the market for these programs cuts horizontally across all industries.

Second, vertical market applications satisfy a need that is specific to a particular industry. A program that performs order entry for appliance retailers is an example. The term vertical is used because the market for these programs cuts vertically within industry types.

Finally, a third type of application program, called custom application programs, comprises those created specifically for the need s of one organization or department. Custom application programs are often developed by the in-house MIS department. They can also be developed by

outside consultants and software development vendors. Since custom applications satisfy a need that is particular to a given company, they cannot be licensed to others. A program that keeps track of operational expenses for the Goodyear blimp is likely to be a custom application program.

Текст 8
The Value Added by Information Systems

Three dimensions of business process are operational control, management control, and strategic planning. Different types of information systems can be used to add value to each of these process dimensions. In general, information systems make processes more efficient or better coordinated, or they improve the working environment, reduce errors, and so forth. Products are the results of processes; they are things, documents, agreements, services, and the like. Products differ in characteristics and delivery. Information systems can add value to products by enhancing their characteristics and by facilitating their delivery. All products have an information component; with information technology, the information components of products are becoming more sophisticated and important. Information systems can make product delivery faster, more convenient, or both. Enhancing products and improving delivery creates a new level of customer expectation and changes the nature of competition.

Management is a social activity. The typical manager spends two-thirds of his or her time in verbal activity. Managers tend more to be information receivers than information givers, and management consists of many brief encounters, many meetings, and very little uninterrupted time. Managers maintain vertical relationships with their subordinates and superiors and horizontal relationships with other departments and external agencies. Since managers are social, information systems that remove managers from people for long periods of time will be disliked. Information systems that improve the productivity of meetings add value to managers. Managers are constantly attempting to gain information. Systems that produce information in context and help managers decide which differences make a difference are valued by managers. Systems must do more than that to add value to managers; systems that facilitate the roles of management will be judged positively by managers.

There are five stages in problem solving: gathering information about the problem, determining alternatives, selecting an alternative,

implementing the solution, and monitoring the situation and the results. The first three stages are sometimes called decision-making. Most business decisions are made by groups. While the quality of a group's decision can be better than for an individual's decision, such decisions take longer. Information systems can facilitate decision-making and problem solving by expanding the bounds of the decision process. They can also help to reveal unknown mental constraints. Information systems can also be used to intentionally deceive. It is natural for humans to distort data in favor of preferred alternatives. Business professionals need to be on guard for biases that cause them to make such unknown distortions in the information they produce. Information systems create competitive advantage by changing the rules of competition.

Текст 9
Workgroups

A workgroup is a collection of people who work together to achieve a common goal. Usually members of a workgroup know one another, and they most often work side by side in the same location. In homogeneous workgroups everyone in the group fulfills the same role. In such groups productive capacity rises in a near-linear rate as employees are added to the group. Work load balancing and morale are common issues in homogeneous workgroups. Information systems tend to be cheaper and easier to build in such groups because everyone does the same job. In heterogeneous workgroups there are several or many different roles and job descriptions. Productive capacity in heterogeneous groups often does not rise at a linear rate. It varies, depending on the expertise of the new person and on the needs of the group. Important challenges in heterogeneous groups concern communication and training. Since there are a multitude of job roles and jobs in a heterogeneous group, many different information systems may need to be developed. This may increase the cost of systems development and necessitate more types of expertise.

Workgroup effectiveness can be measured by output, by personal satisfaction of group members, and by group capacity for future cooperation. Effectiveness is determined by group effort, group knowledge and skill, and by approaches and strategies used to perform work. The major difference between personal MIS and workgroup MIS is that workgroup systems must support controlled sharing of resources. Controlled sharing enables users to access the same resources without interfering with one another. It also enforces security. Systems with large

granularity have high contention, but are easy to administer. Systems with small granularity have low contention, but are difficult to administer.

The major categories of workgroup MIS are hardware-sharing applications, communications applications, analysis applications, and tracking and monitoring applications. Hardware-sharing applications enable members of a work group to share an expensive device such as a laser printer or a large-capacity disk. Communications systems include electronic mail (E-mail), group conferencing, video conferencing, and text-sharing applications. This latter category includes shared word processing and hypertext and hypermedia applications.

Workgroup analysis applications include group spreadsheet applications and group decision support systems (GDSS). Group access to common spreadsheet templates and data enables the workgroup to produce consistent results that can readily be integrated. To date, GDSS have been most effective in facilitating group meetings. A group facilitator has a critical role in such systems.

Workgroup tracking and monitoring applications include multi-user database applications and project management applications. Workgroup database applications that support operations generate operational data that can be subsequently processed to create information to improve workgroup management. This phenomenon is sometimes called informating the activity. Project management applications are especially useful in coordinating workgroup activities- especially when one subgroup is dependent on another for input or other action.

Workgroup MIS add value to process, product, and quality. MIS can be used ti facilitate workgroup operations, management, and strategic planning. They can also be used to enhance features and functions of workgroup products: Workgroup MIS can help to improve or innovate either processes or products as well.

Текст 10
Systems Programs

Enterprise MIS utilize the same four types of programs as do personal and workgroup MIS. There are systems programs, horizontal market application programs, vertical market application programs, and custom-developed programs.

As with hardware, the subject of systems programs for communication processing is exceedingly complicated and involved. As

systems software, they are acquired from the CPU manufacturer, from the vendor of the OS (possibly as part of the OS), or from a specialty software house. The subject is so complicated that most MIS departments allocate their technically accomplished programmers to the tasks of maintaining and, occasionally, modifying the communications programs.

Horizontal market application programs meet needs that cut horizontally across industry types. Some network systems software provides horizontal application programs, for example, TCP/IP provides for a rudimentary E-mail. Beyond such rudimentary capabilities, however, horizontal programs must be acquired in addition to the systems software. An enterprise that wants more sophisticated E-mail, for example, would need to license an E-mail application. The most popular horizontal application for enterprise applications are accounting systems. There are standard packages for general ledger, accounts payable, accounts receivable, payroll, and other, similar accounting and accounting-related applications. There are also horizontal packages in other business areas that tend to be standardized across a number of industries. Most notable are horizontal manufacturing applications for MRP, CAD/CAM, inventory management, machine scheduling, and related applications.

Vertical market application programs are a very large component of the most enterprise MIS. Such programs are developed by independent vendors for application within specific industries. There are vertical market application programs for all types of interdepartmental activities; for example, in the revenue-generation processes, there are order-entry applications for parts distributors, appliance retailers, and computer dealers. Similarly, for purchasing, there are applications to facilitate specific purchasing activities. There are also specialized applications for personnel and payroll applications, asset control, product development and planning, manufacturing, and accounting. Vertical market applications are developed and often supported by VARs. Otherwise, the VAR is paid for support. The choice between these two alternatives depends on enterprise policy, the work load of the MIS department, the capability and quality of the VAR, and the price of the service. Some organizations choose external support for some vertical market packages and in-house support for other packages.

Historically, almost all enterprise application programs were custom developed. It was assumed that, when an organization acquired a computer, it would also need to hire a staff of programmers and other systems development personnel. Today that is not the case, for several reasons. First, when programs are custom developed, the organization must

pay all of the development expense. On the other hand, if programs are purchased, then development expense can be spread across all of the purchasers. This situation pertains to changes to the programs as well. Nothing stays the same, and, as new needs arise, with purchased programs, the cost of adaptation is spread across all the using organizations.

Additionally, developing custom applications requires considerable time. The systems development staff must first acquire the subject matter expertise to develop the application, and then they must design, program, and test it. Then, too, business is dynamic, and during this period the requirements may change. On the other hand, if the applications are acquired from an outside vendor, they can often be installed and operational within 30 to 60 days. Third, developing applications is risky. There is no guarantee that the requirements will be correct or understood; if they are, there is no guarantee that the programs will be correctly written and tested. On the other hand, when acquiring programs that are already developed, an organization can evaluate what it is buying. Such evaluations are themselves risky, but less so that investing in a new development effort.

For these reasons, most organizations today avoid developing custom programs it at all possible. In fact, many companies are converting the custom programs they do have into vertical or horizontal packages. The exception to this is applications whose requirements are so unique that no suitable package exists. With the maturing of the computer software market, this situation is becoming quite rare.

Текст 11
Decision Support and Expert Systems

A knowledge system is a computer-based system that represents knowledge and makes it available to users in a form tailored to the solution of specific problems. Some such systems reduce training time or training cost. Others replicate valuable expertise, and still others reduce operational response time. Another type of knowledge system stores and saves valuable expertise. Knowledge-based system technology is evolving. More knowledge application problems have been envisioned than have been solved. There is even disagreement over what constitutes a knowledge-based system. In this chapter we consider three types: hypertext systems, interactive video systems, and expert systems.

Hyper media documents store text, graphs, diagrams, schematics, and other graphics in computer media. What makes such documents

knowledge systems is not the computer storage, however, but rather the capacity to store access paths in the documents. Thus, experts can establish access paths for non-experts to follow. For example, with a hypertext document, an expert mechanic can leave a path for a beginner to follow when replacing a particular type of vehicle's clutch.

Interactive video links video segments via menu-processing applications. This process allows knowledge stored in video media to be accessed non-sequentially. Such applications involve a greater degree of computer control than do hypertext applications. Interactive video is used primarily in training and advisory capacities.

An expert system is a computer- based information system in which knowledge is represented in data and in which the processing of that knowledge is directed primarily by computer programs. Expert systems have the greatest degree of computer control of the three systems studied in this chapter. The development of systems that process the knowledge of a true human expert has proven to be difficult and expensive. The technology is useful in the solution of many smaller problems, however. Artificial intelligence (AI) is an ambiguous and confusing term. It is often used in marketing for its emotional impact. Most experts agree that a computer system that could pass the Turing test would have AI. To date, however, no such system exists.

An expert system shell is a set of programs used to develop, administer, and process an expert system. A shell contains a knowledge acquisition system, an inference engine, and an explanation system, and a user interface. The inference engine applies knowledge in a systematic way. It applies rules and other forms of knowledge in an attempt to make sequences of logical conclusions that will solve a user's problem. Forward and backward chaining are the two major inferencing strategies. Expert systems can be used to address problems in a number of different problem domains. In increasing order of difficulty, these domains are procedural, diagnostic, monitoring, configuration and design, and scheduling and planning.

There are a number of important arguments against the use of expert systems. These systems have had only limited exposure in the commercial world and only limited success. Some say they are exceptionally difficult to develop and hard to use for any but the simplest of applications. They are hard to maintain; the introduction of new knowledge can have spurious side effects. Expert systems have critics. Some people maintain that expert systems technology results in high development and maintenance costs. Some people believe that expert systems should only be used to develop prototypes of systems; they believe that operational knowledge systems

should be written in conventional programming languages. Still others argue that expert systems are philosophically unsound. They believe that the decontextualization of rules renders them useless, and that, consequently, expert systems can only help in the simplest of interpretations. The proper niche for expert systems lies between simplistic applications and true human experts. Analysis of failures of expert systems indicates that they should be carefully matched with problems of appropriate scope and complexity.

Considering the five components, most expert systems run on conventional computers, especially microcomputers. Expert systems programs can be written in special-purpose, symbolic programming languages such as PROLOG and LISP. These languages are difficult to learn and use, however, and most expert systems programs are developed using specialized shells. There five categories of such shells: inductive rule-based, simple rule-based, structured rule-based, hybrid and domain-specific shells. Expert systems store knowledge in three ways: with rules, frames, and objects. Rules state IF-THEN logic. Frames represent properties of entities to which rules may refer. Objects are extensions of frames that combine data structures with program procedures so as to provide method inheritance. Some developers consider objects to be the key to the next stage of development in expert systems. Expert systems are created by knowledge of engineers who interview domain experts. The domain experts test and modify the expert systems; users employ the expert systems to provide services to clients. Most expert systems are developed using the prototyping process described in Chapter 7. The stages of activity are: defining the problem, classifying the solution, creating the platform, iteratively building the prototypes, and implementing (fielding) the system.

Текст 12
MIS to Support Manufacturing

There are a number of important information systems that support manufacturing. Materials requirements planning (MPR) is an information system that facilitates the purchasing of raw materials. With MPR, the master production schedule, the bill of materials, and the vendor lead times are processed to produce a schedule of raw materials purchases that will enable materials to be available in time while reducing the cost of raw materials inventory.

Sometimes MPR is combined with an inventory management strategy called “just in time” (JIT). With JIT, raw materials or components arrive on the production line, ideally, just as they are needed. The manufacturer has a

blanket purchase agreement with the vendors that details the price and terms of material purchases. As materials are needed, the manufacturer orders a certain number of items under the blanket purchase agreement.

MPR and JIT can be combined. In that case, the manufacturer shares its production schedule with its vendors. Since the vendor knows when the various products will be produced, it can determine when the components that it supplies will be needed. From this, the vendors can better plan their own production schedule. In a sense, the combination of MPR and JIT reduces two inventory management problems (finished goods at the vendor and raw materials at the manufacturer) into one (finished goods at the vendor). In this way, there is one safety stock problem, not two.

Computer-aided design/computer-aided manufacturing (CAD/CAM) is another information system used in production. Here designs from engineering are transformed by an information system into instructions for machines and robots. Thus, a design can be transformed from a drawing into commands to direct a drill press to make certain holes in certain locations or to direct a saw to cut material in certain ways. Robots can be directed in a similar way.

Finally, there are information systems that facilitate production scheduling. There may be dozens or hundreds of different ways of scheduling the production of certain quantities of certain goods within a specified time frame. Some schedules are better than others in that they require fewer machine changes and tool setups. Information systems have been developed to compute the best or, at least, a good schedule for producing the required items. There are benefits of integrating these systems, just as there are benefits of integration in other business areas Computer-integrated manufacturing (CIM) is an attempt to bring the disparate manufacturing information systems together into a single system. All of the information systems discussed here, including MPR, JIT, CAD/CAM, and production scheduling are brought together in a CIM system. Such systems are under development now and will probably come into widespread use during your career.

Текст 13
An Information System

An information system consists of five components: hardware, programs, data, procedures, and people. During the evolution of computer hardware, the focus has moved from left to tight across these components. Early systems focused on hardware, then programs, then data. Today, organizations, people, and procedures are the focus.

First-generation hardware was based on vacuum tubes; second-generation hardware used transistors. Reliability increased dramatically with the use of transistors. Third-generation hardware employed integrated circuits; and fourth-generation hardware used very-large-scale integration (VLSI) of computer circuitry. Today, computer hardware is characterized by dramatic decreases in the price/performance ratio. Hardware can be classified into input, processing, storage, and output categories. Major types of input hardware are keyboard and display screen, mouse, scanner, voice input device, handwriting input device, modem, light pen, and bar code and other readers.

Processing hardware includes the central processing unit (CPU), which is composed of the control unit, the arithmetic-logic unit (ALU), and system or main, memory. Processors are classified in terms of their speed and their data width. Speed can be expressed in terms of cycles, or millions of instructions per second (MIPS). There are two major types of processor memory: read-only memory (ROM) and random-access memory (RAM). The contents of ROM are determined at the time of manufacture and cannot be changed; the contents of RAM are nonvolatile. Programmable read-only memory (PROM) is a second type of ROM that can be programmed at the manufacture's facility. RAM can be read and written by the user, and it is volatile. Microcomputers contain far more RAM than ROM. Computers include a data bus, or processor channel, for connecting the processor to external devices. In a micro, channels contain expansion slots that accept cards to drive printers, plotters, disk units, coprocessors, and similar equipment.

Historically, processing hardware was classified as mainframe computers, minicomputers, and microcomputers. In recent years, these categories have been blurred. Today, what are left of these categories are sociological definitions. They are enterprise, workgroup, and personal applications. Most computers today are complex instruction set computers (CISC). Reduced instruction set computers (RISC) are emerging and may have important performance advantages over CISC. All computers in commercial use today are based on the von Neumann architecture. In the future, parallel computing architectures may become prevalent.

Disks are the most common form of storage for personal information systems. With disks, data is magnetically recorded in concentric circles called tracks. The same amount of data is recorded on each track. Fixed disks can be stacked on the top of one another; a cylinder is composed of all of the tracks that can be read while the read/write heads are held in a fixed position. Fixed disks can be permanent or removable. Diskettes, or

floppy disks, are single-disk units that can be recorded on one or both sides. Two common sizes of floppy disks are 5-1/4 inches (flexible) and 3-1/2 inches (hard plastic case). Diskettes are used, primarily, to transfer data from one computer to another, or for backups.

A second, common type of storage is magnetic tape. Data is recorded in blocks on the tape, and all data must be processed sequentially. It is not possible to update data in the middle of tape file. Tape read/write units are expensive, but the marginal cost of storing data on tape is low. Three types of optical disk exist. CD-POM provides read-only, high-capacity storage. Write-once, read-many (WORM) devices can be written once and can provide a permanent record of transaction. Erasable optical disks can both read and write, through the technology is still developing. The advantage of optical disks is high capacity; the major disadvantages are cost and speed.

Текст 14
Linear Programming

Linear programming is the most famous of the mathematical programming methods that have come into existence since World War 2. It is a technique that allows decision-makers to solve maximization and minimization problems where there are certain constraints that limit what can be done. First used shortly after World War 2 to help schedule the procurement activities of the US Air Forces, linear programming has become an extremely important part of microeconomic theory and a very powerful tool for the solution of managerial problems. Its remarkable growth has been helped along by the development of computers which can handle the many computations that are required to solve large linear programming problems.

Although linear programming is an important tool of microeconomics, it is purely mathematical technique. By itself it can only tell us the implications of the data that the decision-maker or the analyst has gathered or assumed. If these data or assumptions are wrong, the solution will in general be wrong, too. The great advantage of linear programming is that it provides computational advantages, not that it performs magic.

In this Appendix we reexamine the theory of production from the point of view of linear programming. There are at least two reasons for doing so. First, the programming analysis is more fundamental in one respect than the conventional analysis presented in Chapters 6 and 7. The

conventional theory is built on the foundation of the production function, which assumes that the technically efficient production processes have been determined and given to the economist before he or she attacks the problem. But in the real world, the economist is usually confronted with a number of feasible production processes, and it is very difficult to tell which ones – or which combinations – are efficient. The choice of the optimal combination of production processes is an extremely important decision, and it can be analyzed by linear programming. Second, the programming analysis seems to conform more closely to the way that managers tend to view production. The language and concepts of linear programming, though abstract and by no means the same as those of management, seem to be closer to those of management people than the ones used by the conventional theory. Although this is less important than the first reason, it is of some importance, since it makes it easier to apply linear programming than conventional theory. The development of linear programming has enabled the economist to solve many types of production problems for industry and government.

Раздел II. СПЕЦИАЛЬНЫЕ ТЕКСТЫ

Текст 1
The Ammonia Quarterly Market Report Service

High nitrogen prices in the mid-1990s led to increased capacity utilization rates and encouraged a large volume of investment in nitrogen capacity. In 1997, we have seen the consequences of this activity, with markets oversupplied and a sharp downturn in nitrogen prices. In the case of ammonia, between the end of 1996 and June 1997, prices ex-Yuzhnyy fell $70/t to $130/t fob. This level was expected to be real cost floor of exports from the key player in the market, the Former USSR. However, in the second half of 1997 prices fell below $100/t fob. Where is the floor price of the international ammonia market now? What does this floor price mean for producers world-wide? When can we expect to see an upturn in prices again?

The role of national and regional governments in setting grain production targets is diminishing. Conditions in the international grain market are now the dominant driving force behind levels of grain production and exports. When the world grain stock/consumption ratio fell below the 17% level recommended by the FAO in the mid-1990s, grain prices nearly doubled. The stock/consumption ratio has since stabilized at 14-15%, but grain prices have fallen. What are the implications for nitrogen fertilizer and ammonia demand? In which regions are we likely to see significant growth in demand for nitrogen?

In the US, liberalization and gas-on-gas competition during the early 1990s led to a free market for gas and lower feedstock prices. In West Europe, the introduction of competition to the gas market is also under way. In the Former USSR, the establishment of real gas pricing in the last few years, now appears to have reversed. Asia's growing economies and population are placing increasing demands on limited energy resources and nitrogen feedstock prices in most countries of the region are rising. What does this mean for the established ammonia industry in these regions/countries? Where is investment in new capacity for domestic and export markets viable in the future?

In recent years, the international ammonia market has been effectively split into two markets, east and west of Suez. In the last 2 or 3 years, we have seen significant investment in free ammonia capacity in

North America and Trinidad and a decline in the pool of free ammonia capacity in Asia. How will this affect the pattern of world ammonia trade and the balance between the east and west markets?

Текст 2
The Urea Quarterly Market Report Service

International urea prices have declined considerably since early in 1997. Black Sea product has netted back to as low as $80/t, which represents the lowest price level since 1993, and less than half that achieved when the market peaked in 1995. What are the origins of this collapse in urea prices? When can we expect an upturn/

Investment in import substitution and export capacity has accelerated in recent years. With low international urea prices, which projects are under threat? Will we see significant plant closures in Central Europe and the Former USSR? How will these developments impact on international trade?

Production costs are rising in Asia, as competitive pressures from the power generation sector force governments to re-evaluate favourable gas tariffs to urea producers. Which countries will be capable of competing on the international urea market? Can India maintain its urea import replacement programme in the face of inadequate feedstock supplies and a burgeoning fertilizer subsidy bill?

China has dominated the world urea market for many years. Early in 1997, the Chinese government placed a ban on urea imports. Are we likely to see the return of significant Chinese import activity in the medium term? What are the implications of China's inexorable drive towards a market economy for the global urea scene?

Driven by a buoyant international grains market, world nitrogen fertilizer demand has increased substantially in recent years. What are the medium-term implications for urea consumption of the recent financial crisis affecting the Asian 'tiger' economies? What if the crisis spills over to China?

Текст 3
The Five Year Outlook for Phosphate Rock to 2002

The market for phosphate rock continued its growth in 1997 with expanding rock demand and higher prices. As rock producers with integrated downstream plants increased their own rock consumption, less rock was available for export. This situation has resulted in a modest

decline in global trade. Each region of the world faces a unique outlook for these markets over the next five years.

The latest edition of British Sulphur Consultants' annual Five Year Outlook for Phosphate Rock combines a fully up to date assessment of the status of the industry with a detailed analysis of the outlook for the next five years.

Europe: Rock consumption in West and Central Europe has recovered since it dropped in 1993. Will the region see additional growth over the next five years? How will shifts in imports affect world trade?

Former Soviet Union: The FSU is showing signs that the region is adjusting to the new open market system Will rock producers overcome high production costs and expand output to levels not seen since the early 1990's?

United States: Although it is the largest rock producer in the world, the U.S. has witnessed a decline in mine capacity. Despite the withdrawal from the export market, will domestic producers be able to meet the increasing domestic demand for rock? If the U.S. shifts to imports as a source for supply, who will the major trading partners be?

Africa: Morocco holds over 60% of the world's mineable reserves and has increased the production of phosphate rock and downstream fertilizer products. Will it continue to expand rock production and increase its share of world exports?

Middle East: Israel and Jordan are significant players in the phosphate rock markets, but are increasingly processing rock themselves. Have they reached maximum production levels or will they continue to increase rock output? How will they respond to tight global rock supplies, and how much rock could they make available to the market?

Asia: As the second largest rock producing nation in the world, China has significantly increased its production of phosphate rock and downstream fertilizers. Will it keep adding production capacity? How will the recent economic problems of the region affect the overall demand for rock?

Текст 4
The Phosphoric Acid Quarterly Market Report Service

The 1997-2002 edition of British Sulphur Consultants' Five Year Outlook for Phosphoric Acid provides a fully up-to-date analysis of the current industry situation, together with an in-depth appraisal of the outlook to 2002.

Following re-structuring in the early1990s, the phosphate fertilizer industry has recently enjoyed a period of firm and stable prices. Will prices remain stable through 2002 or will they revert to their earlier cyclical, and sometimes volatile, pattern? The report employs an analysis of supply and demand trends to determine an answer.

The low profit margins predicted for phosphate fertilizer projects during the first half of the 1990s led to cancellations and delays for most projects. However, industry profitability has returned and now numerous projects are under study, some of which will come on-stream by the end of 2002. This report examines planned projects and forecasts which will be built over the outlook period.

Phosphate fertilizer demand began to recover in 1993, following five years of declining demand. Demand growth is expected to continue over the next five years, as world food consumption continues to increase. Which regions will show the greatest demand growth for phosphate fertilizers and how will this growth impact the supply/demand and international trade outlook?

Trade is a key component of the phosphate fertilizer industry and about 40% of total demand is met by imports. Asia is a key growth market for both demand and imports. How will the growth in demand impact the need for imports by region and how will any change in imports impact the key exporters, including the U.S., African and Middle Eastern exporters. The report seeks the answers.

Текст 5
Geochemistry

Much of the technology used to find new pay in old plays and bypassed pay in old fields is what you would expect, such as 3-D seismic. High resolution hydrocarbon micro-seepage surveys have come to be recognized as a flexible, low risk and low cost technology that complements the more traditional geologic and seismic methods. It has been documented that hydrocarbon micro-seepage from petroleum accumulations is both widespread and vertical except in the case of very complex geology, according to Schumacher of Geo-microbial Technologies (GMT) Ochelata, Oklahoma. This micro-seepage is also dynamic in that it responds quickly to changes in the reservoir.

A geochemistry survey was implemented using the Microbial Oil Survey Technique (MOST). Developed by Phillips Petroleum and modified by GMT, MOST is based on the presence of hydrocarbon micro-seepage above

buried accumulations. Active micro-seepage is detected by measuring the concentrations and distributions of hydrocarbon-indicating microorganisms found in shallow soils. Over the course of the Montague County survey, 167 shallow soil samples were collected in accordance with MOST procedures to evaluate the hydrocarbon micro seepage patterns of the roughly 3.5 square-mile area previously characterized by the 3-d survey. Because this area had no producing wells prior to this project, it represents a wildcat exploration program, according to Schumacher. The geochem survey revealed only a minor seep anomaly associated with the high, which harbored the selected drilling target. However, it showed a strong extensive seepage anomaly over the low on the Ellenburger surface. A well drilled on the crest of the structure turned to be non-commercial. They drilled and made a field discovery, which has turned into a 14-well field in an old, high-explored area. Four dry holes also were drilled in the conglomerate feature, but they were located in areas outside of the microbial micro-seepage anomalies, Schumacher noted.

Schumacher cited the example of an old field in Argentina with multiple pay zones, where a geochem survey was used to look for bypassed pay and for other applications. “A couple of nice anomalies showed up”, he said, “and when you compare a map of the anomalies with the three productive zones, only one matches. It’s a nice structural closure, and contours on the structure show the closure matches nicely with the geochem”.

Schumacher also cites the results of some recent GMT geochem surveys in western Venezuela- one of which, in an old, nearly depleted field, focused on searching for areas of by-passing pay. There, an area of high micro-seepage was identified next to a trapping fault, representing a part of the field that hasn’t been effectively drained by existing wells. Schumacher noted there are opportunities here for several new wells and/or re-completions. Another geochem survey of a nearby field indicated a strong hydrocarbon seepage anomaly. “The geochem profile also shows two well-defined geochem lows in the immediate vicinity of the producing wells, which is seen commonly”, he said. “Seepage is dynamic, and within weeks to months of a new well going on production, the magnitude of the seepage anomaly decreases dramatically with 100 to 200 meters of the well location.

Текст 6
Current Farm Policies

A maze of legislation governs the agricultural policies of the United States government. Congress debates and passes a basic “farm bill” once

every four years. In addition, many aspects of agricultural policy emerge as byproducts of legislation targeted on other goals. Tax laws, for example, help to channel private investment money into specific aspects of agriculture.

Price Supports. Certain basic commodities are eligible for price supports, which come in the form of a loan from a government agency. Here is how the system works: Congress sets a price-say $2.55 a bushel for corn (one bushel= 35.2 liters) - to represent the supposed value of a crop. Corn farmers who agree to acreage restrictions may borrow $2.55 for every bushel of corn they turn over to the government. In effect, the borrowers pledge their crop to the government as collateral for the loan. If the price of corn rises above $2.55, the farmers can reclaim their corn, sell it on the open market, and pay off the loan. The farmers keep the extra profit. If the price stays below $2.55, the farmers may decide to default on their loans-an action that carries no penalty. The government merely takes over ownership of the corn and either keeps it in storage or sells it at a loss. There is no upper limit on price-support loans to any one farmer.

Deficiency Payments. More important than price-support loams are deficiency payments, which are a direct form of income support for farmers. Congress sets a “target price” for various crops. If the market price that the farmers receive when they sell the crop falls short of the target price, they receive a check from the government to make up the difference. Deficiency payments are limited to $50,000 a year. Price supports and deficiency payments apply only to such basic commodities as grains, dairy products and cotton. Many other crops are not federally subsidized.

Marketing Orders. A few crops, including lemons and oranges, are subject to outright restrictions on marketing. So-called “marketing orders” limit the amount of a crop that a grower can send to market week by week. By restricting sales, such orders are intended to increase the prices that farmers receive. The restrictions are applied by comities of producers within a particular state or region. Marketing arrangements are set up after being approved in a vote of the farmers concerned. Upon certification by the Secretary of Agriculture, the arrangements become mandatory. Thereafter, a farmer who ignores marketing restrictions may be prosecuted in court.

Farm Credit. Access to borrowed money has always been regarded by farmers as crucial to their operations. As early as 1916, the federal government began to provide assistance to private and cooperative farm credit programs. Today, farmers have access to a range of private, cooperative and government lending institutions. One major cluster of

institutions is known as the Federal Farm Credit System. It contains three types of banks that serve specific purposes-making loans on real estate, making loans for such production needs as the purchase of seed and fertilizers and making loans to cooperatives. The country is divided into 12 districts, each containing three federal banks, one for each of the three purposes. The banks finance their operations by selling bonds to investors, just as a business corporation might do. Because the banks have traditionally had a high credit rating, they have been able to borrow at low interest rates, and this has served to keep farm credit costs low. Another source of farm credit is the Farmer's Home Administration, a sort of "lender of last resort" for farmers who cannot get credit elsewhere.

Soil Conservation. Some federal programs are aimed specifically at promoting soil conservation. Under one program, for example, the government shares with farmers the cost of seeding unused land to grass or legumes in order to reduce the danger of erosion.

Providing Water for Irrigation. A federal system of dams and irrigation canals provides water at subsidized prices to farmers in 16 western states. Subsidized water helps to grow 18 percent of the nation's cotton, 14 percent of its barley, 12 percent of its rice and three percent of its wheat.

The government's wide-ranging agricultural programs have developed a strong base support over the years. Members of Congress from farm states regularly win congressional approval for program after program aimed at satisfying a variety of farm interests. Some legislators and presidents have urged congress to cut back the government's role in agriculture and have urged a gradual reduction in farm subsidies and the eventual elimination of government programs to store crop surpluses and to make direct loans to farmers. Some feel these programs represent undue government interference in the operation of a free market. Important economic interests defend many aspects of current farm policy, and proposals to change the system have stirred vigorous debate in Congress.

Текст 7
American Agriculture Today

The successes of American agriculture are easy to see-and many farmers are quick to boast them. They have found much to be proud of, but they have also raised some nagging questions. Thanks to nature's bounty and to the effective use of machines, fertilizers and chemicals, American

farmers are virtually unrivaled in producing crops cheaply and in quantity. The United States produces as much as half of the world's soybeans and corn for grain, and from 10 to 25 percent of its cotton, wheat, tobacco and vegetable oils. American agriculture is, by any standards, big business. Indeed, the term "agribusiness" has been coined to reflect the large-scale nature of agricultural enterprise in the modern U.S. economy. The term covers the entire complex of farm-related businesses, from individual farmer to the multinational maker of farm chemicals. Agribusiness includes farmer cooperatives, rural banks, shippers of farm products, commodity dealers, firms that manufacture farm equipment, food-processing industries, grocery chains and many other businesses.

Both American and foreign consumers benefit from the American farmer's low cost output. American consumers pay far less for their food than the people of many other industrial countries. Moreover, one-third of the cropland in the Unites States is planted in crops destined for export- to Europe, Asia, Africa and Latin America. Agricultural imports lag far behind, leaving a surplus in the agricultural balance of trade. The readiness of many farmers to adopt new technology had been one of the strengths of American agriculture. Computers are but the latest in a long line of innovations that have helped American farmers to cut costs and improve productivity. Yet farmers have been traditionalists as well as innovators. They preserve a deep conservatism and respect for tradition that has helped to lend stability to rural communities in times of rapid change. Farmers in the United States go through alternating periods of prosperity and recession and some farm practices have raised environmental and other concerns. While the high productivity of American agriculture has kept food prices low for consumers, farmers have been perhaps too successful. Crop surpluses and low prices have made it hard for many farmers to make a profit. The cost of the products the farmers buy -tractors, fertilizers, pesticides -has risen faster than the prices they receive for their crops. High interest rates have added to the farmers' burden.

Slightly more than 86 percent of the total number of farms is owned by individuals or families. Some 67,000 farms-or 3.2 percent of the total-are owned by corporations, but most of those corporations are owned by families. People who farm small pieces of land find they cannot invest in the modern equipment they need to make the farms pay. Often, they sell their land – sometimes to other farmers, sometimes to developers who build houses on it. Many farm owners- especially owners of smaller farms-do not work on the farms full-time. Forty-five percent of the people we call farmers actually have other occupations. And not all farmers own their

land. Some 240,000 are tenant farmers-who either rent their land for cash or pay the owner a share of the crops they grow. On large farms, many of the workers are hired only for a specific chore- such as picking crops. Many of these seasonal workers travel from farm to farm, staying only until the crops are picked. They are known as migrant workers. Some are housed under poor conditions, have inadequate health care, and are paid low wages. In recent years, there has been an effort on the part of government and others to improve the lives of these workers.

Critics accuse both corporate and family farmers of damaging the environment. Since 1940s, American farmers have multiplied their use of artificial fertilizers and chemicals designed to kill weeds and insect pests and to protect again crop diseases. Such farming aids have played an indispensable role in increasing crop output, but they have also caused problems. Rainfall that seeps through or runs off the soil has carried fertilizers into ground water, rivers and lakes, damaging water quality and promoting the growth of undesirable water plants. Toxic farm chemicals, some linked to cancer and other diseases, have at times found their way into the nation's water, food and air, although constant vigilance by government officials at the state and federal levels is taken to protect these resources. Some have caused harm to farmers and farm workers-although chemical companies insist that their products are safe when used according to directions. Over the years, many farms pests have developed a resistance to milder chemicals, so farmers have had to resort to stronger and costlier ones.

As they face the future, American farmers can be sure of only one thing- that more changes lie ahead. Ambitious programs of research and development now going on in university, corporate and government laboratories promise to continue the trends of recent years. Many innovations are being considered. One is "no-till" farming, in which farmers plant a new crop directly into the stubble of the old, without turning the soil with a plow. "No-till" depends heavily on chemical weed-killers, and thus has drawn criticism. However, it can reduce erosion and trim the costs of labor and fuel, and many farmers have eagerly embraced the practice. Other innovations are flown from biotechnology, the application of biological science to practical ends. A number of companies are taking the lead in using such techniques as "gene-splicing" to design new plants and animals with desirable traits. Gene-splicing is the artificial alteration of the genes that carry the hereditary characteristics of organisms. Will the future see the development of hardier, more productive plants that need less fertilizer and carry greater

resistance to disease and insects? Biotechnologists hope so. Among other things, they predict that their work will allow farmers to reduce their reliance on toxic chemicals, thus helping preserve a safer environment for everyone.

Текст 8
Steam in Africa

The geographical and political difficulties that have attended the building of railways in Africa have prevented the evolution of anything like a comprehensive network. Generally, railways have been built for specific purposes, usually to enable the products of inland mines to be carried to the coasts, and to minimize the cost and difficulty they have been built to metre or 3fy 6 in(106.7cm) gauges. At one stage the colonist Cecil Rhodes had ambitions to build a railway from the Cape of Good Hope to Cairo, uniting the various British colonies and consolidating the British administration from Egypt to South Africa. This grandiose scheme ignored both the rivalry between the various colonial powers and the sheer scale of the physical barriers. The latter were encountered in full measure by the builders of the Uganda Railway, begun from Mombasa in 1896, and which was forced to climb a series of escarpments, culminating in the 8,327 ft (2,538 m) Mau summit, before reaching its goal of Lake Victoria. Although built to the 3 ft 6 in (106.7) gauge, the Uganda railway was ultimately converted to metre-gauge and formed the basis for the East African Railway connecting Uganda and the Kenyan capital of Nairobi with the port of Mombasa.

In order to obtain sufficient power for working the heavy trains made necessary by the predominantly single-track, narrow gauge lines with restricted loading gauges, articulation was resorted to at an early stage, and of the modern types of articulated locomotive, the Mallet type that was developed so successfully in North America was the first to be used. However, the Mallet system, which mounts a large boiler on two powered bogies, while permitting curves to be negotiated readily, demands a long and cumbersome boiler and, especially in its original compound form, resulted in locomotives of great complexity. Early in the twentieth century, an Australian engineer, Herbert Garrat, developed a new system of articulation, which involves mounting the water tank and fuel bunker on separate engine units fore and aft of the boiler which is carried between the two. As well as allowing the locomotive to pivot at two points, the Garrat

system has a number of other advantages. A high adhesion weight is spread over a long wheel-base, a large diameter of boiler can be used, and the firebox grate can be deep and wide, since there are no wheels and axles underneath to limit its size. The Garrats were developed by the British firm of Beyer-Peacock, and the Beyer-Garrat locomotive proved ideal for African conditions immediately it was introduced in South Africa shortly after the First World War.

The former Rhodesian Railways were also great users of Garrats. More amenable terrain allowed generally higher speeds to be reached with passenger services, and some of the fastest Garrat types were used, though their introduction also allowed an enormous increase in the volume of freight handled. To compensate for the rather slow speeds of passenger trains, a notable line in luxury trains was developed in South Africa, epitomized by the famous Blue Train. This service between Cape Town and Johannesburg had its origin in the Union Limited, established in 1903 to connect with the arrival of the Union Castle mail ship from England. In keeping with this tradition, a special excursion has been mounted by the Railway Society of Southern Africa and using luxury sleeping, dining and lounge cars hauled by a selection of steam locomotives. A ten-day round trip through the spectacular scenery of South Africa in the most luxurious of accommodation makes this one of the ultimate railway excursions. Another tradition which South African railways have maintained is that of innovation in steam locomotive development. Two examples of this were designed to cope with the long stretches of main line through arid country where there was a need for very powerful engines. The first, built by the North British Locomotive company from 1953, was the class 25 4-8-4 with condensing tender. A total of 90 engines were built, along with 50 non-condensing equivalents, and the condensing engines are able to travel the remarkable distance of 700 miles (1,127 km) without taking water. The other dates from 1955, and is a Beyer-Garrat design, the GMAM 4-8-2+2-8-4, which achieves its objective of covering long distances on relatively lightweight track by using an auxiliary water tank holding 6,750 gallons (30713 litres) of water. One of the most notable aspects of this design is the construction of the first example in only seven months from the placing of the order. Conversion to diesel traction on the majority of the African railways, however, meant that the GMAM was one of the last classes of Beyer-Peacock locomotives based on Garrat's design.

Текст 9
The Artificial Heart

Treatment of heart disease is one of the modern medicine's triumphs. Today surgeons routinely perform heart surgery that would have been extraordinary, or even unthinkable, just a few years ago. Even heart transplants, though by no routine, are becoming more common. Transplants, however, pose serious difficulties: a donor heart must become available, blood and tissue must match, and the patient's immune system must be suppressed with medication to ensure that the body does not reject the new heart. The artificial heart is a great achievement for modern medicine, but it also poses important questions that are at the center of the debate over the course of medical care in the United States. For example, does the artificial heart offer enough benefits to patients to justify the suffering caused by such an operation? What is the quality of life for an individual who, for the time being, must remain attached to the bulky air compressor which powers the heart? Who should be chosen to receive artificial hearts?

The development of the artificial heart represents the kind of dramatic medical advance that Americans have come to expect in recent decades. As medical knowledge has advanced, so has the average life expectancy, from 69 years in the 1950-s and 60-s to 75 years today. Physicians now can treat heart disease and cancer with a variety of drugs or surgical techniques. Individuals whose kidneys have failed can live for years with regular dialysis, or cleansing of their blood, to remove waste products. Drugs are used to control high blood pressure- a risk factor in both strokes and heart attacks. Cardiac pacemakers, or heart regulators, keep many people from dying of abnormalities in the heart rhythm. Surgery, drugs and radiation treatments keep cancer patients alive longer. Childhood leukemia and Hodgekins' disease no longer carry with them an automatic sentence of death. Surgeons can replace damaged joints with artificial ones, and eye doctors use lasers and other advanced techniques to preserve or restore sight. Advances in microsurgery have even made it possible to reattach limbs which have been detached in accidents, and burn victims benefit from the development of new skin grafting techniques. Among the hundreds of newly developed drugs are tranquilizers, or calming drugs, which have made it possible to release many patients from mental hospitals. Physicians, however, are not miracle workers, and the public's expectations of medical progress sometimes outstrip reality. There are no inoculations against cancer or heart disease. Since physicians often

cannot predict who will benefit from a treatment, they generally recommend treating every patient who has even a slight chance of benefiting. Physicians work long hours and must accept a great deal of responsibility because many medical procedures, even routine ones, involve risk. Sophisticated new machines have been developed to enable physicians to scan body organs- even the brain-with a clarity never before possible. One technique involves the use of ultrasound- sound waves beyond the frequencies that human beings can hear- to produce images. Others use computers to capture and analyze images produced by X-rays or magnetic fields. These machines often make unnecessary older diagnostic tests which are painful and sometimes dangerous. As a result, new technologies also mean new personnel. Physicians, nurses and orderlies can no longer staff a hospital alone. Hospitals now require a bewildering number of technical specialists to administer mew tests and operate advanced medical equipment.

Текст 10
The Court System

The Supreme Court is the court of final appeal and it may rule in cases in which someone claims that a lower court ruling on a Federal law is unjust or in which someone claims there has been a violation of the United States constitution, the nation's basic law. The Supreme Court consists of a chief justice and eight associate justices, and the responsibility and power of these nine people are extraordinary. There are many federal courts in the system which has the Supreme Court as its head. In addition, each state within the United States has established a system of courts, to deal with civic, criminal and appellate proceedings. There are also county and city courts. Even many of the smallest villages, those in which only a few hundred people live, have a local judge, called a'' justice of peace'', who handles minor legal matters. There are separate military courts for members of the armed forces and other specialized courts to handle matters ranging from tax questions to immigration violations. Supreme Court decisions can affect the lives of all Americans and can change society significantly. In the past, Supreme Court rulings have halted actions by American presidents, have declared unconstitutional- and therefore void- laws passed by the Congress (the government's lawmaking body), have freed people from prison and have given new protection and freedom to black Americans and other minorities.

The Constitution, written in 1787, established a government of three branches. One of these is the judicial branch, and the Supreme Court of the United States is the most powerful part of it. The other two branches of the national government are the legislative, which consists of a Congress of elected representatives of people, and the executive, headed by the president as a chief of state. The procedure for naming justices to the Supreme Court is one example of how this distribution of powers, called ‘’checks and balances’’, works. The chief justice and the associate justices are named by president. This authority represents great power, considering the major effect court decisions have on the legal system and on society in general. For that reason, no one can become a member of the court unless the upper house of Congress- the United States Senate- approves. Once approved, a justice cannot be removed by either the President or the Congress without very good reason, nor can the salary of the justices be reduced. The chief justice and associate justices, therefore, serve on the court for life and need not –and should not- take into consideration political issues or the opinions of officials in the other branches of government when making legal decisions.

The main work of the Supreme Court is to make the final decision in legal cases in which a charge of violation of the Constitution is made. The Constitution gives certain powers to each branch of the federal (national) government. It also gives certain powers to the governments of states, creating a federal system in which power is divided between national and state authorities. Whenever a charge is made that a person or agency in any part of the federal or a state government has broken the law, the Supreme Court may eventually be asked to decide the case. When it does, the decision itself becomes law. Most cases- and some of the best-known- that come before the Supreme Court involve charges that individual rights or freedoms have been violated. Such cases arise because the Constitution guarantees these rights and freedoms to everyone.

Not all cases are settled in the Supreme Court. Only a small percentage wins the attention of the chief justice and the associate justices. Many cases sent to the Supreme Court are studied by the justices and then sent back to the court or person from which they came. That means that, as a lower court has ruled on the case, the ruling remains in effect. Lower courts often hear cases and make decisions that are extremely important to large groups of people. The importance to Americans of the Constitution, the law and the principles of equal justice is best understood through discussion of some cases that the Supreme Court has decided. They include

freedom of speech, freedom of religion, freedom of press and freedom to assemble to public and to ask the government to consider grievances. Among the other guarantees are the right (in criminal cases) to be judged in a public trial by impartial jury, the right to be represented by a lawyer at one's trial and freedom from cruel or unusual punishment.

Текст 11
Demands and Rewards in Hospitality Industry

Because the hospitality industry requires frequent interactions with people, job candidates must demonstrate solid communication skills. Employees at every level need to communicate well; the ability to handle difficult guests or to direct staff while maintaining good employee relations requires effective, tactful communication.

Getting a job interview usually requires applicants to 'sell' themselves in a well- written resume and concise cover letter. A resume is a formal written presentation of an individual's work experience, skills and education. A cover letter explains the specific job sought and reiterates the applicant's relevant experience for the job. Job candidates should think of their resumes and cover letters as sales tools to get them interviews, where they will have the opportunity to complete the sale by persuading the employer to hire them. It is vital that these sales tools be as well-written and persuasive as possible. Industry executives agree unanimously that the great majority of applicants do not effectively promote themselves in their resumes and cover letters. These applicants often fail to get interview and therefore lose employment opportunities. A great number of books on resume and cover letter writing are available to help job candidates today.

The interview itself is another place where good communication skills are important. The main purpose of a resume is to get an interview; the main purpose of an interview is to get a job offer. Applicants should demonstrate an ability to understand and answer questions articulately while displaying a friendly, helpful demeanor. Applicants should also discuss their skills, education, and experience that make them especially suited to a job. Finally, job candidates can display their skills in communication and courtesy- another trait essential for successful hospitality employees- by sending a brief thank-you note to the interviewer following the interview.

As is the case in many professional fields, the turnover rate of new graduates entering the hospitality industry is significant. One reason for

this seems to be that many people are attracted to the hospitality field without really knowing what they are getting into. Once employed, they discover that the job is not what they expected. They dislike the long hours, low pay rates, and physical labor associated with beginning jobs. They recognize too late that they must work weekends, evenings, holidays and ay other times when most people are not required to work.

Partly to alleviate this turnover problem, most college and university hospitality programs now require student internships in the industry prior to graduation. By giving students on-the-job experience before they graduate, student internships help students gain an understanding of the industry and its job requirements and demands. They learn what to expect in their first post-graduation jobs. If their internship work experiences are unsatisfactory, they may realize, before committing themselves to several years of study that the hospitality industry is not for them. In addition, some of the turnover could be avoided if students were better informed about the range of opportunities available in some of the other, less visible segments of the industry.

Hours of work have changed in hotels and restaurants. The 40-hour work week is now in effect throughout much of the industry; the days of extremely long hours and split shifts are history. But work hours may be non-standard or unusual, especially in hotels, which must keep their doors open 24 hours daily. The work may be during the evening and night, and it often includes holidays and weekends. Occasionally, a little extra time may be called for to ensure complete service to the guests. The employee who moves up into the managerial ranks will likely put in some extra hours. Anyone aspiring to management positions cannot be a clock watcher.

While many entry-level jobs in hotels and restaurants pay only minimum wage, advancement may come rapidly. The pay rate for skilled-and managerial- level jobs in lodging and food service is competitive with those in other industries. The U.S. Bureau of Labor Statistics notes that wages for skilled-and managerial- level positions in the hospitality industry vary greatly depending upon the size of the establishment, previous work experience, educational background, and job duties. Labor unions, region of the country, and chain affiliation (if any) may influence wages and benefit programs.

A hotel and restaurant work shift varies dramatically from hour to hour. It has peaks and valleys, changing from quiet to busy in a matter of minutes. Hospitality is never a routine business. Every day brings new problems to be solved and new excitement. Anyone who enjoys a lack of

routine will find the business fascinating. Those who prefer a more orderly routine may find the industry too unpredictable. It is not that hotels and restaurants are disorganized operations; it is simply the nature of the business that it is impossible to harness the ups and downs to produce a crisis-free routine.

Since the advent of mass production in American industry, opportunities for workers to take pride in what they produce have been greatly reduced. In the personal service field, however, this opportunity still exists. The chief creates his or her own culinary masterpiece and views it with personal pride and satisfaction. The same is true for the baker, the pastry chief, the pantry personnel, and many others. For many hospitality employees, the product-service- is intangible, but the recipient expresses thanks and satisfaction directly, allowing the employee to know that the work is appreciated and to have a feeling of accomplishment.

Hotels and restaurant are sensitive to changes in the national economy. Both types of businesses typically offer stable employment. For those who possess the interest, technical skills, emotional makeup and motivation, the hospitality industry offers some of the most fascinating, rewarding careers available anywhere.

Текст 12
The Big Four: Britain's Railways

The year 1975 saw the passing of a century and a half of passenger train operations by steam. The Stockton and Darlington Railway of Henry Pease proved to the world that the Stephensonian steam locomotive was the only practical prime mover, though in truth the Middleton Railway in Leeds and Trevithick before that had been forerunners in the race. But it was the Liverpool and Manchester and Grand Junction lines which really placed steam traction on the map and the names of the great engineers in the history books; George Stephenson, Robert Stephenson, Locke, Bury, Brunel and Gooch, all now house-hold names. With the engineers and the railways came the inevitable amalgamations, the Railway Mania and finally the building, stage by stage, in earnest competition, of the great trunk lines which still exist today. It is interesting to note that it is the early railways joining the major towns which still remain, whilst their younger sisters, built with a desire to tap what was left of the traffic, have disappeared under relentless economic pressure and the change brought about by the invention of the internal combustion engine.

The lines engineered by the Stephensons, Locke and Brunel- Liverpool to Manchester, Liverpool to Birmingham, Birmingham to London and London to Bristol, are still vital arteries for both passenger and freight, where inter-city trains roll behind purring electric and snarling diesels. The later line of the Watkin Empire, the Manchester Sheffield and Lincolnshire Railway's extension to London, ambitiously styled the Great Central, has gone and the last main line to Scotland, the Midland, is in danger. Duplication routes can no longer stand up against the motor car and lorry, the improved roads and the motorways. Britain's railways, great and small, found themselves in dire trouble after the First World War, and by 1923 all were grouped into four main companies: the London, Midland and Scottish, the London and North Eastern, the Great Western and the Southern. A few minor- very minor- lines escaped the net, but most were absorbed into one or other of the Big Four. World War 2 saw to it that even this situation was no longer tenable, and after twenty-five years of tribulations, competition and economic problems, the Four were welded into one under nationalisation; the lame ducks were to be fed by the British tax- payer for his convenience.

With the help of carefully chosen pictures, mostly in colour, this book tells this story of the four main lines, their evolution, their public and private faces, train operation, signaling, locomotive and coach development over a hundred and twenty-five years, with the emphasis on the period from 1923 to 1948. Though little of the text may be new to the enthusiast, the pictures, brought together in this context, are evocative of an exciting period of railway development. Today, with a modern railway system that is constantly in need of cash transfusions but nevertheless provides essential services appropriate to the times, it is easy to forget that railways were once built not only to provide public transport, but also to bring a profit to their shareholders- and good profits too for many years. These early days provided little in the way of competition except for the horse, and, just as the great trunk lines of Canada and America opened up those huge countries, so it was with Britain in Victoria's reign. The story of the Big Four is one of big change which the companies could not digest, partly through the constraints put on them. For instance, freight charges were set by the book, leaving road transport to undercut these at will. Yet for the enthusiast they were interesting though somewhat sad years; interesting because of the tremendous variety of locomotive power, the charming branch lines, and the introduction of new and larger engines; and sad because all these were slowly to disappear.

The Big Four have now passed into history and even the bric-a-brac of the old-type railway system is being swept away relentlessly. That period was still one of solidarity, of the steam engine, semaphore signals, cavernous stations and the railway horse to help with the shunting. It is worthy of remembrance.

Текст 13
Planning the Timetable

One of the most fascinating aspects of railway working is the complex task of preparing and publishing the timetable. In any large industrial undertaking production planning is an essential part of the business process and this is particularly so in the railway industry. Here the commodity produced- rail transport- is not normally a single standard unit, but a wide range of individual items embracing high-speed inter-city expresses, heavily loaded commuter trains and various types of freight working. The job of a train planning organization is to co-ordinate the use of various resources- the track, signaling, stations, yards, locomotives, passenger stock, crews, wagons- so as to produce a passenger and freight timetable plan to meet the requirements of the railway's customers. They are also responsible for the production of both the public and internal railway working timetables and supporting publications, such as locomotive and coaching stock programmes, which are the means of communicating to the railway staff concerned the detailed information necessary to keep the trains on the move.

Since the business of a railway is to convey passengers and to move freight, the first stage of timetable planning is the basic commercial decision regarding the level of service to be provided. While the probable requirements of passengers can be fairly easily established, because of the nature of much of today's rail freight movement- bulk trains of cement, oil, steel, coal and high-speed Freightliner container services- finalization of freight train schedules involves close consultation with the individual companies concerned.

Preliminary planning of passenger train services usually starts with analyses of ticket sales and train loadings, which are considered against estimates of the future level of business from certain passenger stations and on the trains in the service. From this data the commercial department defines the outline of the type of service to be offered. The outline would include: frequency of service on weekdays, Saturdays and Sundays; the

time of first and last trains; selection of intermediate stops; average speed and journey time; train formation; proportion of first- and second-class accommodation; and type of catering. With the basic commercial requirements agreed, work can start in the train planning department on the first draft of the timetable.

There are many factors which affect the running of a train- the power of the locomotive and weight of the train, the maximum permitted speed on each section of route, the type of signaling governing, the headways between successive trains and so on- so the train planning staff first settle the basic timetable data for each service. This would usually include: train timing based on power/weight ratio; additional recovery allowances to be added to schedules to offset the effect of temporary engineering work on the route; signalling; station allowances; focal point on which service is to be planned and principal connections. In addition the type of traction power, availability of crews and provision of rolling stock has also to be settled.

All the basic data required for train planning is of course established. The motive power department has on record point-to-point running times for each type of locomotive hauling varying train loads covering the entire system. Compared with steam power, where the performance of the locomotive depended on the quality of the coal and the physical efforts of the fireman, running times for electric or diesel locomotives can be calculated with much greater precision. The signalling characteristics of each route which sets the headways necessary between trains are also known to the planning staff. From the foregoing commercial and operating considerations train planning can then proceed.

Before describing the techniques of train planning and timetable production it would be helpful briefly to outline the scope and function of this part of a railway organization. Past experience has shown that train planning activity is best organized on a centralized basis. The consultation necessary if the timing of trains is divided between different offices slows down the administrative process; also, as rolling stock is programmed to run not only throughout a railway region but, if circumstances dictate, anywhere in the country, centralized planning is an advantage. On British Railways today each of the five railway regions has its own centralized train planning organization forming part of the chief movements of manager's organization. The largest of BR's five train planning offices is that for the London Midland Region located at Crewe. Over 200 people work on the planning and production of the London Midland region

timetable. Broadly, the work covers the preparation of all train service details, programming of rolling stock and crews and the forward planning of new projects. The organisational arrangements vary on European railways, but most also seem to favour a centralized approach.

Despite the development of computer techniques and sundry trials and demonstrations, the traditional method of timing on a large graph is still used. A train graph consists of a time scale along the top from left to right and a distance scale, representing a specific section of line, along the side. In addition to the distance scale a plan of the track layouts, junctions, loops and stations is also set out on the left-hand side of the graph. Lines representing the position and progress of individual trains are plotted on the graph in accordance with the point-to-point running times. The lines drawn on the graph vary for different types of trains, and different colours are sometimes used to identify trains running on fast or relief tracks. Simple graphical presentation has many advantages. The capacity of any section of route can be seen at a glance and the situation at junctions or stations, where trains have to cross other tracks and possibly conflict with the passage of other movements, can be quickly assessed. The position at large passenger stations and freight yards is a particularly important part of the timetable plan, since no purpose would be achieved if a path for a train was established from, say Crewe to Euston, if no platform was available to receive the train at the proposed arrival time. The availability and occupation of platforms at large stations is sometimes worked out on a bar chart graph in association with the main train graph.

Although the feasibility of a proposed timetable plan is verified by plotting the paths for the trains on the graph, certain preparatory work is of course possible in advance. For example, the departure times of the principal inter-city services from large centres such as London, Manchester, Liverpool, Edinburgh, Bristol and so on can be settled at an early stage of the basic planning. As is the case on almost all main routes on BR, departure times from starting stations are standardized for particular destinations – on the hour from Euston to Manchester or Liverpool, 10 and 40 minutes past for Birmingham, 5 minutes past for the North West and Scotland, for example – and as the paths for fastest trains have obviously to be allocated at first, the skeleton outline of the most important train times is decided prior to the graphing stage. The importance and value of the train graph occurs at the second stage, when track space has to be found for many less important passenger and freight trains. Preparation of a train graph thus starts with the plotting of the paths

of the principal inter-city trains. Then follow stopping passenger trains, particularly those that have to be timed to connect with express services at certain stations. But although express services are usually given priority, it is not always the case; for example, city terminals often have to cope with the simultaneous requirements of home-going commuters and the early evening inter-city trains for businessmen returning to the province.

A simple principle of timetabling is that a greater number of trains can be run over a section of line if they all travel at equal or near equal speed – a classic example is the London Transport underground, where as many as 40 trains an hour can be worked at 1 ½ -minute intervals on a given section, but only because they all stop at reasonably equally spaced stations and run at similar speed. Conversely, if the trains out of Kings Cross just mentioned were timed to depart in any order, without regard to the speed or sequence of stops, an absurd situation would ensue with fast trains forced to dawdle behind low trains and wasting valuable line capacity. Hence, the grouping of trains on flights – railway operators call it the correct speed mix – is a widely used timetabling tactic. As the timing and scheduling of each group of express trains is finalized, the train graphs for the sections of route are built up, showing the planner at a glance whether track capacity is being allocated efficiently and train timings are feasible.

With the important stage of planning of passenger trains completed, work will start on timing the slower – but no less vital- freight services. Compared with the situation 15 or even 10 years ago, the basic tempo of freight train operation on BR, and on many other railways, has drastically changed. Today a substantial volume of freight is moved in block trains running at speeds up to a maximum of 75mph. There is less of a problem running the fast freight services at night but slower freight trains continue to create timing problems at all times of day. There is an interesting train timing situation on the West Coast main line between Crewe and Carlisle in the night hours. Between 23.30 and 04.30 no fewer than 18 trains – overnight sleeping car services; newspaper, postal and parcels trains; company freight trains and Freightliner services – have to be accommodated over the long two-track section of route on the climb up to Snap summit. Sleeper trains must not reach their destinations unduly early –passengers would not wish to be turned out of their berths at say 04.00 – and it is possible to run them on timings similar to the express freights. But the 45mph freight trains are difficult to work into the graph paths. They are obviously allocated paths on relief lines wherever possible, but on two-track sections it is often necessary for slow freights to stand in loops or sidings and wait for a path to the next loop behind a group of faster trains.

Train timing is a continuing process and work on the next, or even the next but one timetable is in progress before the current timetable year is brought into effect. To reduce the very high costs of timetable production BR opted several years back for an annual timetable to run from May each year, instead of separate books for the summer and winter periods. A year-round only became possible after a majority of inter-city routes were put on to fixed-interval timings and the one-time steep peak of July and August holiday train demand was blunted by the rise in air and road travel. To ensure that the timetable is completed in time for implementation, the production of the timetable is itself strictly phased and controlled by a production schedule plan. In fact, 1972-73 was an unusually complex year for BR timetable planning as the completion date for the extension of electrification over the West Coast route from Weaver Junction to Glasgow approaches.

Timetable planning is not concerned only with use of the track. Among other equally important resources of the railway to be considered is, of course, the provision of rolling stock, locomotives and train crews. Simply stated, every train planned needs a set of carriages or wagons, a locomotive and a crew, and these requirements must be given due weight as part of the timetable production process. No separate part of the basic planning can be undertaken in isolation and the first ideas for even small changes to a service have to take account of the availability of passenger stock and locomotives. In practice the availability is established at the outset although not necessarily in finalized detailed form. A simple case in point is the passenger stock situation of the LMR Euston-Manchester-Liverpool electrified service. On this route the utilization of stock has reached a level of efficiency unheard of in steam days – many sets of stock run four single journeys each day and cover regular daily distances of nearly 800 miles. Other train sets only complete three or two trips. So when it was recently agreed to meet a public need for early-morning trains to get businessmen to their destination by 09.30, involving departures around 07.00, there was no stock problem as the additional early journeys could be programmed by bringing trains into service earlier than previously.

Текст 14
Gap Widens Between Needs and Resources

Because people are finding themselves facing life problems they never could have imagined, the need for civil legal aid is now greater than ever.

The sudden and dramatic downturn in economic conditions makes it difficult to track the standard indicators of poverty. However, extrapolating

from poverty population increases documented by the U.S. Census Bureau through 2006, at least 15,000 more low-income households per year require civil legal aid than required such help in 2000.

CLEAR, the Northwest Justice Project's Coordinated Legal Education, Advice and Referral phone service is the gateway into Washington state's civil legal aid system.

CLEAR lines are open five days per week, with 23 attorneys providing intake, advice, legal assistance and referral to thousands of people facing crises from eviction to bankruptcy; from foreclosure to domestic violence.

Even before the current economic crisis, CLEAR was operating at the limits of its capacity. CLEAR maintains 30 dedicated telephone lines and employs sophisticated software and screening systems that allow the greatest number of clients to be served within the limits of existing resources. Phone lines fill up quickly after opening, and as each call is completed, a new one takes its place. In one week in January 2009 an average of 1,600 calls were attempted each day. The Northwest Justice Project did not have sufficient capacity to meet demand on the CLEAR system before, and is unable to increase staff to respond to increased demand resulting from the current economic crisis. As a result, many more low-income people who need legal help as a result of personal and family crises receive a busy signal when they call the CLEAR line.

The state-funded civil legal aid system works to address civil legal problems that affect the most critical problems faced by low-income and vulnerable residents-family safety, housing preservation, access to essential health, income and nutritional services and the like. Cases involving family conflict comprised more than half of all 2008 cases. These cases focus on ensuring protection from domestic violence and threats to the life, safety and security of families with children. The second most common area of legal assistance involved preservation of housing, including private and subsidized tenancies, foreclosure and foreclosure rescue scams. Health care, consumer protection and income maintenance made up 12% of all 2008 cases.

Текст 15
The Gravitational Collapse

Gravitational collapse – the tendency of material bodies to fall toward some common center of gravity – plays a central role in shaping the

universe. It is through gravitational collapse that stars are born, that clusters of stars are formed and probably that entire galaxies are created. It is in gravitational collapse that some stars, star clusters and perhaps galaxies eventually die. Gravitational collapse is thus both the midwife and the undertaker of astrophysics.

The role of gravitational collapse as midwife and undertaker can be summarized as follows. The raw material from which stars, star clusters and galaxies are born is a dilute gas, chiefly hydrogen. Occasionally a large blob of this gas, on being squeezed slightly by random motions in nearby blobs, begins to collapse on itself in response to the mutual gravitational attraction of its particles. Because the gravitational attraction between any two particles increases rapidly as the distance separating them is reduced, the collapse accelerates. It cannot be halted until large turbulent motions have been created inside the collapsing blob, providing enough thermal pressure to balance gravity. When this happens, the blob becomes a star, a star cluster or a galaxy.

On reaching its new state of equilibrium the object – star or star cluster – cannot remain stable forever. It gradually loses energy to surrounding space. Stars radiate energy in the form of heat and light. Clusters lose energy by the occasional ejection of a star. As it loses energy the object becomes more tightly bound by gravity and therefore contracts. The contraction can be only temporarily halted by the burning of nuclear fuel. In the long run, all nuclear fuel will be exhausted and the contraction will resume.

A star or star cluster cannot depend on internal thermal pressure to balance the force of gravity indefinitely as it contracts. After a million to 10 billion years for stars – whose contraction is temporarily halted by nuclear burning – and after a period longer than the present age of the universe for star clusters, including galaxies, the slow contraction must terminate in one of three processes. First, a nuclear explosion may blow the object apart before it has had a chance to die in any other way. Second, if the object has a mass less than 1.2 times the mass of the sun, and if no explosion blows it apart, its contraction can be halted forever by non-thermal pressures. The object then becomes a white-dwarf star like the ‘dark’ companion of Sirius, or a cold object like the earth. The third process operates if the object has a mass greater than 1.2 solar masses and does not explode; the contraction then leads eventually to a state so condensed that gravitational forces overwhelm all internal pressure, thermal or non-thermal. At this point catastrophic gravitational collapse begins, terminating the ordinary life of the object.

Catastrophic gravitational collapse has never been observed directly. The collapse of a star would happen so fast that an astronomer would have virtually no chance of looking at the right spot at the right instant to observe it. But even if he had the luck to be watching, he might not realize he was seeing a star collapsing. The details of collapse (sudden dimming and disappearance of the star) might be masked by light from the star's outer envelope, thrown off as the interior collapsed. Nevertheless, it is possible to infer on theoretical grounds the stages by which catastrophic collapse would proceed. This collapse may be the source of the huge energies radiated by supernovas and by the baffling quasi-stellar objects (quasars).

Once a star begins to collapse, whether it can stop or must continue without stopping depends on whether it reaches a critical dimension known as the gravitational radius. Collapse can be halted anywhere outside this radius but never inside it. Similarly, energy can be released from a collapsing star that it still larger than the gravitational radius but not from a star that has contracted inside that radius. Current studies suggest that only the most massive stars can collapse through their gravitational radius when their thermonuclear energy is exhausted. Less massive stars probably collapse to a certain point and then explode, perhaps producing the supernovas that astronomers observe at a rate of about one per cent century per galaxy.

Imagine that we are observing a massive star whose nuclear fuel has been used up after several billion years, and that the thermal pressure that has resisted the force of gravity has finally started to weaken. The star begins to collapse, slowly at first and then more rapidly. Because the surface of the star has a temperature of at least several thousand degrees Centigrade, it continues to emit protons, or quanta of light. As the collapse progresses protons that leave the surface at an angle are bent into curved orbits by the increasing intensity of the star's gravitational field, in accordance with the celebrated prediction of Einstein's general theory of relativity. The farther the collapse proceeds, the more strongly the proton orbits are bent. Until the star contracts to 1.5 times the gravitational radius, a point called the first critical stage, all protons emitted from the surface eventually escape into space and could be seen by a distant observer. Protons emitted at a tangent to the star's surface at the first critical stage are caught in a spherical cloud from which they slowly leak forever. Consequently a distant observer viewing the late stages of collapse will always see the rim of the star as it was when the star passed 1.5 times the gravitational radius.

Текст 16
The Primeval Fireball

Modern cosmology undertakes to substitute observational science for myth and speculation in dealing with such issues as: How did the universe originate? What is it like now? What will it be its fate? Unfortunately, the observational evidence is meager. As a matter of fact, most contemporary cosmologies stem from just one such observation that other galaxies are moving away form ours, and are doing so at speeds that are greater the more distant the galaxy. This general recession is the basis for such widely different concepts as the "big bang" cosmology (which holds that the universe originated in a super-dense state some seven billion years ago) and the "steady state" one (in which the universe looks exactly the same through all time – past, present and future).

It now appears that radio astronomers have discovered another basic cosmological phenomenon that, like the recession of the galaxies, provides a view of the universe on a truly universal scale. It is low-energy cosmic radio radiation that apparently fills the universe and bathes the earth from all directions. When it was discovered we realized that it could not have originated in the earth's atmosphere or in our galaxy. It did fit in well, however, with an earlier suggestion that one ought to be able to detect a new kind of cosmic radio radiation: a "primeval fireball" of radiation surviving from the earliest days of the universe, when the universe was enormously hot and contracted. The discovery and identification of this radiation must be considered a revolutionary development in cosmology. If, as we now believe, it is indeed the primeval fireball, it provides a view of the very early universe, just as optical radiation provides a look at the universe of more recent times.

The concept of the primeval fireball is grounded on Hubble's observation of the general recession and the idea that flows from it: that the universe is in a state of rapid expansion. If it is so, according to big-bang theories at some time in the distant past – about seven billion years ago – all the matter in the universe must have been packed together in an inferno of particles and radiation. As the universe expanded out of this holocaust the matter cooled and condensed to form galaxies and stars. The radiation, which had started out as enormously energetic gamma rays, was also "cooled" by the expansion; its wave-length increased and it now appears mostly in the radio and microwave bands. The idea of a "fireball" dating from the big bang can be somewhat misleading, because what we have in mind is not radiation from some localized explosion off in one corner of

the universe. The earth is immersed in this fireball; the radiation comes at us from every direction and any observer anywhere in the universe should detect it as coming equally from all directions.

This is consistent with the basic theoretical framework developed by Albert Einstein, Alexander Friedmann and others. Basic to the work of all of them was the picture of an evolving universe that looks the same to all observers, no matter where they are. In particular such a universe has no boundary, no edge. It is also isotropic, which is to say that it looks much the same in any direction. The presence of matter causes a uniform curvature of space. On this model the primeval fireball radiation might be represent by a number of ants crawling over the surface of the balloon. They are uniformly distributed, and they crawl about in all directions. The number of ants in any given area of the surface decreases as the balloon is blown up. In the same way the density of photons in the primeval fireball decreases as the universe expands. Note also that no matter which way the ants move they will always move toward polka dots that are receding from them, and they must continuously lose energy as a result of this chase. In the real universe the photons of the fireball are always chasing galaxies that are receding from them, so that the photons undergo a continuous energy loss that accounts for the increase in their wavelength.

Раздел III. НАУЧНО-ТЕХНИЧЕСКИЕ ТЕКСТЫ

Текст 1
Energy Research: Options for the 21st Century

The study has analyzed the state-of-the-art and technological opportunities in different areas of science and technology, and proposes a strategy for Swedish energy R&D. Research has two objectives. One is of course to advance the science. Another objective is to create new competence. Increased competence through participation in the research work is also an important element in the results. In most cases this objective is the most important one. Therefore, we recommend a research strategy that includes a broad spectrum of research activities designed to enhance national competence in all energy-related areas of relevance for the future. There has been a tendency in Swedish energy R&D to give priority to research areas where Sweden has little scientific and industrial strength and to give less attention to areas where we are more competitive. Special efforts should be made in those particular areas where Sweden already has or can create comparative advantages.

Traditionally there has not been a very clear view on the objectives of Swedish energy R&D. Obviously two major aims are to make the energy system more environmentally sound and more cost-effective. However, there are two more aspects that should be considered. The present energy systems lack flexibility. A flexible energy system makes it easier to cope with crises, for instance, shortages of oil, and it also makes it easier to take advantage of new research findings and new technologies. Thus the study has formulated the following policy for Swedish energy R&D.

Swedish R&D in the field of energy should make a significant contribution to the development of a cost-effective, environmentally sound and flexible energy system and increase Sweden's international competitiveness in industry and research. Key technologies include systems technology, advanced maintenance technology, nuclear technology (including both fusion and fission), gasification and combustion technology, material engineering, surface physics and chemistry, together with biotechnological research directed at natural and artificial photosynthesis.

Systems technology is essential for the development of the transport sector, for electric power, environmental control and energy conservation.

The complexity of the energy system calls for a comprehensive view and understanding of the interaction between different sectors of the energy system and society as a whole.

Materials engineering is vital to developments in, for instance, gasification and combustion engineering, building design, fuel cells, solar cells, measuring and control technology and nuclear waste technology. A research area related to material engineering is thin film and surface physics. Developments in this area are vital to the development of fuel cells, solar energy conversion, catalysts and sensor technology. Areas of research closely related to materials engineering and thin film technology include chemistry, physics, mechanics och materials and sold state physics. Developments in biotechnology can be vital for developments in solar energy conversion, biomass production, capturing carbon dioxide, and possibly direct conversion of biomass. Areas of research closely related to biotechnology include biology, physics and biochemistry. Nuclear power technology is vital for maintenance, operation and improvements in existing nuclear power plants. The option to develop the next generation of nuclear power plants should be kept open. In the longer term, fusion and transmutation can also become viable alternatives. Research in nuclear power technology is relevant also to elementary particles physics, plasma physics and accelerator technologies.

Текст 2
Swedish Energy Research: Ambitions and Reality

At the beginning of the 1980s, the Swedish resources devoted to energy R&D were the highest per capita in the OECD-area. Resources in Sweden have since then decreased to a level still slightly above average. This is mainly the effect of a decrease in resources allocated at “later” stages of the R&D-process, that is, resources going to development, demonstration, et cetera. Priorities differ, however, quite markedly from those in almost all other countries. Sweden has had a much stronger focus on “alternative” energy sources, that is, wind power, solar energy, efficient use of energy etc, while the resources going to fossil energy and nuclear energy (which dominate in most other countries) are proportionately less.

Our evaluation shows that the most significant result of the research is increased competence in certain fields of technology. These include wind power, bio-energy, environmental impact and energy efficiency. There are few examples of commercial application of the research even if

there are some examples of how that research has speeded up the market penetration of new technology. Important examples of this can be found in the pulp and paper industry, iron and ore industry and in construction. Research has also had some negative effects on technological areas that have not been a part of the program. These areas have lost ground or been hampered by the considerable resources available for "alternatives". Such technological areas include electric power technology and, during the 1980s, nuclear technology.

The energy sector is important in Sweden. The most significant contributions to technical development have taken place in the electricity sector where Sweden has a large and important electro-technical industry, power industry and also a large electricity-intensive industry. For many years, a great deal of technical development has been conducted in Sweden. Technology has been developed to meet the needs of Swedish customers and has then been transformed into successful products on the international market. Nowadays, very little technology is developed primarily with Swedish customers in mind. This is one consequence of decreasing Swedish investment volume and increasing development costs.

Текст 3
Chemistry in Action: Mad as a Hatter

Mercury has been known since ancient times. It is the only metal that exists as a liquid at room temperature. Although mercury is rarer than gold and platinum, its sources are so much more concentrated that the metal can be obtained readily. The principal ore of mercury is mercury sulfide called cinnabar. The ore is first concentrated by flotation and then roasted in air to yield mercury oxide, which decomposes to yield mercury vapor. Metallic mercury is a bright, silvery, dense liquid that freezes at -38.9 °C and boils at 375 °C. Liquid mercury dissolves many metals, such as copper, silver, gold, and the alkali metals, to form amalgams that may be either solids or liquids. The reactivity of a metal is generally lowered when it is amalgamated with mercury. For example, the sodium-mercury amalgam is so much less reactive than sodium that it decomposes water at a considerably slower rate. Such amalgams are useful as mild reducing agents in organic synthesis.

The most common mercury compound is probably mercury chloride, an insoluble white solid, called calomel. At one time, calomel was used in

medicine as purgative. It has been estimated that mercury and its compounds have over 2000 uses. Only the more familiar and important applications will be mentioned here. Mercury has a large and uniform coefficient of volume expansion (with temperature) and is therefore suitable for thermometers. The liquid has a very high density and is employed in barometers. Although the conductivity of mercury is only about 2 percent that of copper, the advantages of its fluidity is so great that the metal is used in making electrical contacts in household light switches and thermostats. Mercury is also used as the cathode in the electrolytic production of many elements, for example, chlorine.

Mercury is a heavy metal poison whose influence is cumulative and whose effects on neurological behavior are notorious. However, the toxicity of mercury very much depends on the physical and chemical states of the element. Pure metallic mercury is not particularly poisonous; in fact, ingestion of a very small amount of mercury (as from the dental amalgam mentioned on p.810) produces no noticeable ill effects. The metal apparently passes through the body without undergoing chemical change. Mercury vapor, on the other hand, is very dangerous because it causes irritation and destruction of lung tissues. Although the liquid is not very volatile, prolonged exposure to mercury vapor should be avoided. Because the substance is so widely used in households and laboratories, spillage of mercury occurs frequently. Simple calculations show that as little as 3 mL of mercury could saturate a large (and poorly-ventilated) room with its vapor within a week, making it unsafe to work in. Spilled mercury is almost impossible to recover completely because the liquid enters the cracks in the floor. The usual remedy is to cover the mercury with yellow sulfur powder, which retards the evaporation rate by reducing its surface area and also slowly converts the mercury to the les harmful compound. The toxicity of inorganic mercury compounds depends on their solubilities. For example, the insoluble mercurous chloride is not considered very toxic and, in fact, has been used in medicine as a purgative and a drug to kill intestinal worms. Such treatment may be termed selective poisoning. The substance is harmful to the human body; but, by a judicious choice of the quantity administered, the poison kills the worms before it endangers the patient. Because mercuric salts are generally more soluble, they are considerably more toxic. The mercury ions concentrate chiefly in the liver and kidneys. The harmful effects are usually slow to develop. Some symptoms are sore gums and loose teeth. Mercury poisoning can cause brain damage to unborn.

Текст 4
Metallurgical Processes

Most metals occur in nature in a chemically combined state as minerals. A mineral is a naturally occurring substance with a characteristic range of chemical composition. A mineral deposit concentrated enough to allow economical recovery of a desired metal is known as ore. Metallurgy is the science and technology of separating metals from their ores and of compounding alloys. (An alloy is a solid solution composed of two or more metals, or of a metal or metals with one or more nonmetals.) The three principal steps in the recovery of a metal from its ore are (1) preparation of the ore, (2) production of the metal, and (3) purification of the metal.

Preparation of the ore. In the preliminary treatment of an ore, the desired mineral is separated from waste materials-usually clay and silicate minerals which are collectively called the ‘’gangue’’. One very useful method for carrying out such a separation is called ‘flotation’. In this process the ore is finely ground and added to water containing oil and detergent. The liquid mixture is then beaten or blown to form’ a froth’. The oil preferentially wets the mineral particles, which are then carried to the top in the froth, while the gangue settles to the bottom. The froth is skimmed off, allowed to collapse, and dried to recover the mineral particles. Another physical separation process makes use of the magnetic properties of certain minerals. The mineral magnetite (Fe3O4), in particular, can be separated from the gangue by using a strong electromagnet. Substances like iron and cobalt that are strongly attracted to magnets are called ferromagnetic. Mercury forms amalgams with a number of metals. (An amalgam is an alloy of mercury with another metal or metals). It can therefore be used to extract metal from ore. Mercury dissolves the silver and gold in an ore to form a liquid amalgam, which is easily separated from the remaining ore. The gold or silver is then recovered by distilling off the mercury.

Production of metals. Because metals in their combined forms always have positive oxidation numbers, the production of a free metal is always a reduction process. Preliminary operations may be necessary to convert the pre to a chemical state more suitable for reduction. For example, an ore may be roasted to drive off volatile impurities and at the same time to convert the carbonates and sulfides to the corresponding oxides, which can be reduced more conveniently to yield the pure metals. This last equation points up the fact that the conversion of sulfides to

oxides is a major source of sulfur dioxide, a notorious air pollutant. The development in recent years of processes for converting this by-product to sulfuric acid instead of releasing it into the air has helped to reduce SO2 emissions in some parts of the country. How a pure metal is obtained by reduction from its combined form depends on the standard reduction potential of the metal. Currently the major metallurgical processes are carried out at high temperatures in a procedure known as 'pyrometallurgy'. The reduction in these procedures may be accomplished either chemically or electrolytically. Chemical reduction: Theoretically we can use a more electropositive metal as a reducing agent to separate a less electropositive metal from its compound at high temperatures. In some cases even molecular hydrogen can be used as a reducing agent, as in the preparation of tungsten (for making filaments in light bulbs) from tungsten oxide. Electrolytic reduction is suitable for very electropositive metals, such as sodium, magnesium, and aluminum. The process is usually carried out on the anhydrous molten oxide or halide of the metal.

Purification of metals. Metals prepared by reduction usually need further treatment to remove various impurities. The extent of purification, of course, depends on the use to be made of the metal. Below we describe three common purification procedures.

Distillation. Metals that have low boiling points, such as mercury, magnesium, and zinc may be separated from other metals by fractional distillation. One well-known method of fractional distillation is the Mond process for the purification of nickel. Carbon monoxide gas is passed over the impure nickel metal at about 70 °C to form the volatile tetra carbonyl nickel, a highly toxic substance, which is separated from the less volatile impurities by distillation. Pure metallic nickel is then recovered from Ni (CO) 4 by heating the gas at 200 °C.The carbon monoxide that is released is recycled back into the process. 2. Electrolysis. Electrolysis is another important purification technique. The copper metal obtained by roasting copper sulfide usually contains a number of impurities such as zinc, iron, silver, and gold. The more electropositive metals are removed by an electrolysis process in which the impure copper acts as the anode and pure copper acts as the cathode in a sulfuric acid solution containing Cu2+ ions. Iron and zinc, like the other more reactive metals in the copper anode, are also oxidized at the anode and enter the solution as Fe2+ and Zn2+.They are not reduced at the cathode, however. The less electropositive metals, such as gold and silver, are not oxidized at the anode. Eventually, as the copper anode dissolves, these metals fall to the bottom of the cell. Thus, the net result of this electrolysis process is the transfer of copper from the

anode to the cathode. Copper prepared this way has a purity greater than 99.5 precent. 3. Zone refining. Another often-used method of obtaining extremely pure metals is zone refining. In this process a metal rod containing a few impurities is drawn through an electrical heating coil that melts the metal. Most impurities dissolve in the molten metal. As the metal rod emerges from the heating coil, it cools and the pure metal crystallizes, leaving the impurities in the molten metal portion that is still in the heating coil. (This is analogous to the freezing of seawater, in which the solid that separates is mostly pure solvent-water. In zone refining the liquid metal acts as the solvent and the impurities as the solutes.)When the molten zone carrying the impurities, now at increased concentration, reaches the end of the rod, it is allowed to cool and is then cut off. Repeating this procedure a number of times results in metal with purity greater than 99.99 percent.

Steel-making. Steel manufacturing is one of the most important metal industries. In the United States, the annual consumption of steel is well above 100 million tons. Steel is an iron alloy that contains from 0.03 to 1.4 percent carbon plus various amounts of other elements. The wide range of useful mechanical properties associated with steel is primarily a function of chemical composition and heat treatment of a particular type of steel. Whereas the production of iron is basically a reduction process (converting iron oxides to metallic iron), the conversion of iron to steel is essentially an oxidation process in which the unwanted impurities are removed from the iron by reaction with oxygen gas. One of several methods used in steelmaking is the basic oxygen process. Because of its ease of operation and the relatively short time (about 20 minutes) required for each large-scale (hundreds of tons) conversion, the basic oxygen process is by far the most common means of producing steel today.

Текст 5
Nuclear Fusion

In contrast to the nuclear fission process, nuclear fusion, the combining of small nuclei into larger ones, is largely exempt from the waste disposal problem. Figure 23.2 shows that for the lightest elements, nuclear stability increases with increasing mass number. This behavior suggests that if two light nuclei combine or fuse together to form a larger, more stable nucleus, an appreciable amount of energy will be released in the process. This is the basis for ongoing research into the harnessing of nuclear fusion for the production of energy. Nuclear fusion occurs

constantly in the sun. The sun is made up mostly of hydrogen and helium. In its interior, where temperatures reach about 15 million degrees Celcius, the following fusion reactions are believed to take place. Because fusion reactions take place only at very high temperatures, they are often called thermonuclear reactions.

Fusion reactors. A major concern in choosing the proper nuclear fusion process for energy production is the temperature necessary to carry out the process. These reactions take place at extremely high temperatures, of the order of 100 million degrees Celcius, to overcome the repulsive forces between the nuclei. Compared with the fission process, nuclear fusion looks like a very promising energy source, at least 'on paper'. Its advantages are that (1) the fuels are cheap and almost inexhaustible; (2) the process is ''clean''; that is, except for thermal pollution, it produces little radioactive waste; and (3) it is a safe process. If a fusion machine were turned off, it would shut down completely and instantly; there would be no possibility of a meltdown. If nuclear fusion is so great, why isn't there even one fusion reactor producing energy? Although we command the scientific knowledge to design such a reactor, the technical difficulties have not yet been solved. The basic problem is finding a way to hold the nuclei together long enough, and at the appropriate temperature, for fusion to occur. At temperatures of about 100 million degrees Celcius, molecules cannot exist, and most or all of the atoms are stripped of their electrons. The state of matter, in which a gaseous system consists of positive ions and electrons, is called plasma. The problem of containing this plasma is a formidable one. What solid container can exist at such temperatures? None unless the amount of plasma is small, but then the solid surface would immediately cool the sample and quench the fusion reaction. One approach to solving this problem is to use magnetic confinement. Since the plasma consists of charged particles, moving at high speeds, a magnetic field would exert force on it. Figure 23.17 shows a recent magnetic confinement design, called 'tokamak'. The plasma moves through this doughnut-shaped tunnel, confined by a complex magnetic field. Thus plasma never comes in contact with the walls of the container. Another promising development employs high-power lasers to initiate the fusion reaction. In test runs a number of laser beams transfer energy to a small fuel pellet, heating it and causing it to implode, that is, to collapse inward from all sides and compress into a small volume. Consequently, fusion occurs. Like the magnetic confinement approach, laser fusion presents a number of technical difficulties that still need to be overcome before it can be put to practical use on a large scale.

The hydrogen bomb. The technical problems inherent in the design of a nuclear fusion reactor do not affect the production of a hydrogen bomb, also called a thermonuclear bomb. In this case the objective is all power and no control. Hydrogen bombs do not contain gaseous hydrogen or gaseous deuterium; they contain solid lithium deuterium (LiD), which can be packed very tightly. The denotation of a hydrogen bomb occurs in two stages-first a fission reaction and then a fusion reaction. The required temperature for fusion is derived from an atomic bomb. Immediately after the atomic bomb explodes, the following fusions occur, releasing vast amounts of energy. There is no critical mass in a fusion bomb, and the force of explosion is limited only by the quantity of reactants present. Thermonuclear bombs are described as being 'cleaner' than atomic bombs because they do not produce radioactive isotopes except for tritium, which is a weak B-particle emitter, and the products from the fission starter. Their damaging effects on the environment can be aggravated, however, by incorporating in the construction some non-fissionable material such as cobalt. Upon bombardment by neutrons, cobalt-59 is converted to cobalt-60, which is a very strong G-ray emitter with a half-life of 5.2yr.The presence of these radioactive cobalt isotopes in the debris or fall-out from a thermonuclear explosion would cause the deaths of those who survived the initial blast.

Текст 6
Nuclear Reactors (1)

A peaceful but controversial application of nuclear fission is the generation of electricity using heat from a controlled chain reaction in a nuclear reactor. Currently, nuclear reactors provide about 20% of the electrical energy in the United States. This is a small but by no means negligible contribution to the nation's energy production. Several different types of nuclear reactors are in operation; we will briefly discuss the main features of three of them: light water reactors, heavy water reactors, and breeder reactors.

Light water reactors. Most of the nuclear reactors in the United States are light water reactors. Figure 23.10 is a schematic diagram of such a reactor, and Figure 23.11 shows the refueling process in the core of a nuclear reactor. An important aspect of the fission process is the speed of the neutrons. Slow neutrons split uranium-235 nuclei more efficiently than do fast ones. Because fission reactions are so exothermic, the neutrons

produced usually move at high velocities. For greater efficiency they must be slowed down before they can be used to induce nuclear disintegration. To accomplish this goal, scientists use moderators, which are substances that can reduce the kinetic energy of neutrons. A good moderator must satisfy several requirements: it must be a fluid so it can be used also as a coolant; it should possess a high specific heat; it should be nontoxic and inexpensive (as very large quantities of it are necessary); and it should resist conversion into a radioactive substance by neutron bombardment. No substance fits all these requirements, although water comes closer than many others that have been considered. Nuclear reactors using light water as a moderator are called light water reactors because H is the lightest isotope of the element hydrogen. The nuclear fuel consists of uranium, usually in the form of its oxide. Naturally occurring uranium contains about 0.7 % of the uranium-235 isotope, which is too low a concentration to sustain a small-scale chain reaction. For effective operation of a light water reactor,uranium-235 must be enriched to a concentration of 3 or 4 %. In principle, the main difference between an atomic bomb and a nuclear reactor is that the chain reaction that takes place in a nuclear reactor is kept under control at all times. The factor limiting the rate of the reaction is the number of neutrons present. This can be controlled by lowering cadmium or boron rods between the fuel elements. Without the control rods the heat generated would melt down the reactor core, releasing radioactive materials into the environment. Nuclear reactors have rather elaborate cooling systems that absorb the heat generated by the nuclear reaction and transfer it outside the reactor core, where it is used to produce enough steam to drive an electric generator. In this respect a nuclear power plant is similar to a conventional power plant that burns fossil fuel. In both cases large quantities of cooling water are need to condense steam for reuse. Thus, most nuclear power plants are built near a river or a lake. Unfortunately this method of cooling causes thermal pollution.

Heavy water reactors. Another type of nuclear reactor uses D2O, or heavy water, as the moderator, rather than H2O.Heavy water slows down the neutrons emerging from the fission reaction less efficiently than does light water. Consequently, there is no need to use enriched uranium for fission in a heavy water reactor. The faster-moving neutrons travel greater distances, and so the probability that they will strike the proper targets-uranium-235 isotopes-is correspondingly high. Eventually, most of the uranium-235 isotopes will take part in the fission process. The main advantage of a heavy water reactor is that it eliminates the need for building expensive uranium enrichment facilities. However, D2O must be prepared by either fractional

distillation or electrolysis of ordinary water, which can be very expensive considering the quantity of water used in a nuclear reactor. In countries such as Canada and Norway, where hydroelectric power is abundant, the cost of producing D2O by electrolysis can be reasonably low. At present, Canada is the only nation successfully using heavy water nuclear reactors. The fact that no enriched uranium is required in a heavy water reactor allows a country to enjoy the benefits of nuclear power without undertaking work that is closely associated with weapons technology.

Текст 7
Nuclear Reactors (2)

Breeder reactors: A breeder reactor uses uranium fuel, but unlike a conventional nuclear reactor, it produces more fissionable materials than it uses. We know that when uranium-238 is bombarded with fast neutrons the following reaction takes place. In this manner the non-fissionable uranium-238 is transmuted into the fissionable isotope plutonium-239, which has a half-life of 24,000yr.In a typical breeder reactor, nuclear fuel containing uranium-235 or plutonium-239 is mixed with uranium-238 so that breeding takes place within the core. For everyuranium-23 (or plutonium-239) nucleus undergoing fission, more than one neutron is captured by uranium-238 to generate plutonium-239. Thus, the stockpile of fissionable material can be steadily increased as the starting nuclear fuels are consumed. An important factor is the doubling time, the time required to produce as much net additional nuclear fuel as was originally present in the reactor. It takes about 7 to 10 years to regenerate the sizable amount of material needed to refuel the original reactor and to fuel another reactor of comparable size. Another fertile isotope is thorium-232.Upon capturing slow neutrons, thorium is transmuted to uranium-233, which, like uranium-235, is a fissionable isotope.Uranium-233 is stable enough for long-term storage. The amounts of uranium-238 and thorium-232 in Earth's crust are relatively plentiful (4 p. p.m. and 12 p. p.m. by mass, respectively).Despite the promising prospects, the development of breeder reactors has been very slow. To date, the United States does not have a single operating breeder reactor, and only a few have been built in other countries, such as France and Russia. One problem is economics; breeder reactors are more expensive to build than conventional reactors. There are also more technical difficulties associated with the construction of such reactors. As a result, the future of breeder reactors, in the United States at least, is rather uncertain.

Hazards of nuclear energy: There are many people, including environmentalists, who regard nuclear fission as a highly undesirable method of energy production. Many fission products such as strontium-90 are dangerous radioactive isotopes with long half-lives.Plutonium-239, used as a nuclear fuel and produced in breeder reactors, is one of the most toxic substances known. It has an A-emitter with a half-life of 24,000yr.Accidents, too, present many dangers. The accident at the Three Mile Island reactor in Pennsylvania in 1979 first brought the potential hazards of nuclear plants to public attention. Only a few years later, the disaster at the Chernobyl nuclear plant in the Soviet Union, on April 26, 1986, was a tragic reminder of just how catastrophic a runaway nuclear reaction can be. On that day, a reactor at the plant surged out of control. The fire and explosion that followed released much radioactive material into the environment. People working near the plant died within weeks as a result of the exposure to the intense radiation. The long-termed effect of the radioactive fallout in the western Soviet Union and Europe has not yet been clearly assessed, although agriculture and dairy farming have already been affected by the fallout. The number of potential cancer deaths attributable to the radiation contamination is estimated to be between a few thousand and more than 100,000. Furthermore, the problem of radioactive waste disposal has not been satisfactorily resolved even for safely operated nuclear plants. Many suggestions have been made as to where to store or dispose of nuclear waste, including burial underground, burial beneath the ocean floor, and storage in deep geologic formations. But none of these sites has proved absolutely safe in the long run. Leakage of radioactive wastes into underground water, for example, can endanger nearby communities. The ideal disposal site would seem to be the sun, where a bit more radiation would make little difference, but this kind of operation requires 100% reliability in space technology. Because of the hazards, the future of nuclear reactors is clouded. What was once hailed as the ultimate solution to our energy needs in the twenty-first century is now being debated and questioned by both the scientific community and laypeople. It seems likely that the controversy will continue for some time.

Текст 8
Oil Pollution of the Sea

Oil pollution of the sea became a serious problem after World War 1 when oil increasingly superseded coal as a fuel. Ships were converted from

coal to oil burning and large fleets of tankers were built up to transport crude oil for refining in Europe and America. Without proper legislation to restrain ships' masters, indiscriminate discharge of sludges and oil-contaminated washings and ballast waters has caused increasingly serious fouling of beaches, harbours and marine equipment and the destruction of coastal flora and fauna in the inter-tidal zone. Surveys have shown that, on average, 100,000 sea birds are being killed every year on the British shores by oil from the sea. The cost of the pollution to fishermen, local councils, harbour authorities and the holiday trade is certainly millions of pounds annually. The main sources of pollution are both the heavy sludges which collect at the bottoms of the tanks and are periodically liberated by oil tankers and also the tank washings and ballast waters contaminated with oil and oil/water emulsions emanating from both oil tankers and cargo vessels.

There are basically three methods of dealing with oil once it has escaped from a tanker. One can attempt to recapture it, set it on fire, or treat it with a variety of chemical agents with the object of dispersion it in the sea or causing it to sink. The choice of method in any particular case depends enormously on the circumstances. The recapture method is, in principal, applicable both to oil that has already been washed up on the shore and to oil that is still floating on the sea, providing it can be swept into a pool several centimeters deep but of a manageable area. On the shore the method involves shoveling, scraping or bulldozing the cliffs, boulders, rocks and sand on which the oil has settled, transporting the material to dumps in disused quarries and either burying it or setting on fire. At sea the object is to pump the oil into other ships, after first containing it within a flexible structure of plastics, inflated Dracones or wood and hessian which is made to float two-thirds or more under water. A ring of this type 1.5 km in diameter should have contained the entire cargo. On winching it in, the oil should have remained sufficiently deep for it to have been pumped off the sea and into barges. Despite the hazards of carrying out such an operation in the open sea in the vicinity of a massive pool of fresh oil, the technique is fundamentally sound and in more favourable weather might well have worked. But, in the event, sweeping up proved to be more successful- not immediately but after about two weeks when the more volatile fractions and water soluble acids had gone. The black mass that then remains on the sea is much more viscose than the original crude. Setting fire to oil either in the open sea or on the shore is not as straightforward as it might at first seem. In the first place crude oil contains

many components of widely differing volatility and inflammability, from light petroleum fractions used in cigarette lighters and for motor car fuel to heavy bituminous substances used for tarring roads or waterproof roofs. Crude oil also contains an appreciable proportion of solid to semi-solid particles of asphalt and resin. Under the action of the Sun and wind the volatile fractions soon evaporate. They leave behind a much less inflammable residue whose consistency, depending on the source of the crude, may resemble motor car lubricating oil or black vaseline. To make this catch fire it is necessary to raise its temperature to several hundred degrees. After it has been in contact with sea water for a few days the crude becomes partially emulsified. The emulsion is of the water –in –oil type, the same as butter. It consists of globules of water encased in sheaths of oil and has an appearance and consistency rather similar to heavy axle grease. The presence of as much as 20 per cent by weight of water in oil which has been in contact with the sea for any length of time obviously has a very dampening effect on its ability to support combustion. Not only has the oil itself to burn but it has also to turn large quantities of the emulsified water into steam and this tends to extinguish the flames.

Chemical methods for dealing with oil pollution of the sea can be very effective but expensive when used on a large scale. When crude oil is shaken up with sea water either of two things may occur. Individual drops of oil may become suspended within a bulk of water or individual drops of water may become enclosed in a bulk of oil. The first constitutes an oil-in-water emulsion, the second- a water-in-oil emulsion. In any patch of oil on the sea both types of emulsion will normally be present. These emulsions are rendered stable by two classes of material, both of which occur naturally in crude oil. Asphaltic and resinous particles, which are more readily wetted by oil than by water, favour the formation of the water-in-oil emulsions. So-called ‘green acids’ (sulphonic acids and sulphonates) favour the reverse type. The basis of the first of the two of the chemical treatments for removing oil from the sea or shore is to reinforce the action of the natural green acids at the expense of the asphaltic and resinous particles. This can turn the water-in-oil emulsion which can then spread out and disperse in the surrounding water. Housewives use this technique to clean butter off crockery by adding a detergent. The active ingredient, as far as oil dispersal is concerned, is a ‘surfactant’of which there are more than 10,000 types known. When such a material is added to a water-in-oil emulsion the tail groups penetrate into the oil and dissolve, displacing any particles of asphalt. But the head groups, having little affinity for oil, prefer

to remain in the water. The water-in-oil emulsion is converted into the oil-in-water type. Since each group of oil has now become encased in an envelope of surfactant head groups, which are soluble in water, the drops as a whole become soluble and so mix freely with the water and disperse. The second of the two chemical methods is the ‘sinking’ technique. Basically, the oil is treated with a powder into which it will be absorbed to form flocculi. For this to occur, the surface of the powder must be oleophilic. Oleophilic powders must be denser than water to sink the resulting flocculi. This technique was employed when a material called Carbosand was used to flocculate and sink crude oil which had accumulated in the harbour of Baltimore. Carbosand is essentially finely divided sand coated with carbon. It was spread evenly over the harbour in a fine coat. Shortly afterwards the oil partially coalesced into tar-like masses and slowly sank to the bottom. Another experiment was carried out in the open sea. A low flying plane sprinkled a flocculating powder on to a patch of oil and, although the wind carried quite a lot of powder away, about three-quarters of the oil was sunk. It would have been of the greatest value if, instead of waiting for oil slicks of the size released by the tanker in the Torrey Canyon, a comprehensive program of research and development had been undertaken earlier on powders for flocculating and sinking oil.

Текст 9
Some Definitions of Energy

Energy is a much-used term, although it represents a rather abstract concept. Unlike the matter, energy cannot be seen, touched, smelled, or weighed. Energy is known and recognized by its effects. It is usually defined as the capacity to do work. ’’Work’’ has a special meaning to scientists. In the study of mechanics, work is ‘’force x distance’’ but we will see later that there are other kinds of work. All forms of energy are capable of doing work (that is, of exerting a force over a distance), but not all of them are equally relevant to chemistry. The energy contained in tidal waves, for instance, can be harnessed to perform useful work, but the importance of tidal waves to chemistry is minimal. We will discuss some forms of energy that are of particular interest to chemists.

Radiant energy from the sun (solar energy) is Earth’s primary energy source. Solar energy is responsible for heating the atmosphere and Earth’s surface, for the growth of vegetation through the process known as photosynthesis, and for global climate patterns.

Thermal energy is the energy associated with the random motion of atoms and molecules. In general, thermal energy can be calculated from temperature measurements-the more vigorous the motion of the atoms and molecules in a sample of matter, the hotter the sample is and the greater its thermal energy. However, we need to distinguish carefully between thermal energy and temperature. A cup of coffee at 70^C has a higher temperature than a bathtub filled with warm water at 40^C,but much more thermal energy is stored in the bathtub water because it has a much larger volume and greater mass than the coffee and therefore more water molecules and more molecular motion. It is important to understand the distinction between thermal energy and heat. Heat is the transfer of thermal energy between two bodies that are at different temperatures. Thus, we often speak of the ‘’heat flow’’ from a hot object to a cold one. Although ‘’heat’’ itself already implies the transfer of energy, we customarily use terms such as ‘’heat absorbed’’ or ‘’heat released’’ to describe the energy changes occurring during a process.

Chemical energy is a form of energy stored within the structural units of chemical substances; its quantity is determined by the type and arrangement of atoms in the substance being considered. When substances participate in chemical reactions, chemical energy is released, stored, or converted to other forms of energy.

Energy is also available by virtue of an object’s position. This form of energy is called potential energy. For instance, because of its altitude, a rock at the top of a cliff has more potential energy and will make a bigger splash in the water below than a similar rock located part way down. Chemical energy can be considered a form of potential energy; it is associated with the relative positions and arrangements of atoms within the substances of interest.

Energy available because of the motion of an object is called kinetic energy. The kinetic energy of a moving object depends on both the mass and the velocity of the object.

All forms of energy can be changed (at least in principle) from one form to another. We feel warm when we stand in sunlight because radiant energy from the sun is converted to thermal energy on our skin. When we exercise, stored chemical energy in our bodies is used to produce kinetic energy of motion. When a ball starts to roll downhill, its potential energy is converted to kinetic energy. You can undoubtedly think of many other examples. Scientists have reached the conclusion that although energy can assume many different forms that are inter-convertible, energy can be

neither destroyed nor created. When one form of energy disappears, some other form of energy (of equal magnitude) must appear, and vice versa. The total quantity of energy in the universe is thus assumed to remain constant. This statement is generally known as the law of conservation of energy.

Текст 10
The Kinetic Molecular Theory of Liquids and Solids

In Chapter 5 we saw how the kinetic molecular theory could be used to explain the behavior of gases. That explanation was based on the understanding that a gaseous system is a collection of molecules in constant, random motion. In gases, the distances between molecules are so great (compared with their diameters) that, at ordinary temperatures and pressures (say, 25 °C and 1 atm), there is no appreciable interaction between the molecules. This rather simple description explains several characteristic properties of gases. Because there is a great deal of empty space in a gas, that is, space not occupied by molecules, gases can be readily compressed. The lack of strong forces between molecules allows a gas to expand to the volume of its container. The large amount of empty space also explains why gases have very low densities under normal conditions.

Liquids and solids are quite a different story. The principal difference between the condensed state (liquids or solids) and the gaseous state lies in the distance between molecules. In a liquid the molecules are held close together, so that there is very little empty space. Thus liquids are much more difficult to compress than gases and much denser under normal conditions. Molecules in the liquid are held by one or more types of attractive forces, which will be discussed in the next section. A liquid also has a definite volume, since molecules in a liquid do not break away from the attractive forces. The molecules can, however, move past one another freely, and so a liquid can flow, can be poured, and assumes the shape of its container.

In a solid, molecules are held rigidly in position with virtually no freedom of motion. Many solids are characterized by long-range order, that is, the molecules are arranged in regular configurations in three dimensions. The amount of empty space in a solid is even less than in a liquid. Thus solids are almost incompressible and possess definite shape and volume. With very few exceptions water being the most important), the density of the solid is higher than that of the liquid for a given substance.

Intermolecular Forces. Attractive forces between molecules, called ‘’intermolecular forces’’, are responsible for the non-ideal behavior of gases that was described in Chapter 5.They are also responsible for the existence of the condensed states of matter-liquids and solids As the temperature of a gas is lowered, the average kinetic energy of its molecules decreases. Eventually, at a sufficiently low temperature, the molecules no longer have enough energy to break away from one another’s attraction. At this point, the molecules aggregate to form small drops of liquid. This phenomenon of going from the gaseous state to the liquid state is known as condensation. In contrast to intermolecular forces are ‘’intra-molecular forces’’, or forces that hold atoms together in a molecule. Intra-molecular forces are responsible for the stability of individual molecules, whereas intermolecular forces are primarily responsible for the bulk properties of matter (for example, melting point and boiling point).

Generally, intermolecular forces are much weaker than intra-molecular forces. Thus it usually requires much less energy to evaporate a liquid than to break the bonds in the molecules of the liquid. For example, it takes about 41 kJ of energy to vaporize 1 mole of water at its boiling point; it takes about 930 kJ of energy to break the two O-H bonds in 1 mole of water molecules. The boiling points of substances often reflect the strength of the intermolecular forces operating among the molecules. At the boiling point, enough energy must be supplied to overcome the attraction among molecules so that they can enter the vapor phase. If it takes more energy to separate molecules of substance A than of substance B because A- molecules are held together by stronger intermolecular forces than in substance B, then the boiling point of A is higher than that of B. The same principle applies also to the melting points of the substances. In general, the melting points of substances increase with the strength of the intermolecular forces.

Текст 11
The Liquid State

Now that you are familiar with intermolecular forces, we can look at the properties of substances in condensed state, which are largely determined by those forces. We will start with the liquid state. A great many interesting and important chemical reactions occur in water and other liquid solvents, as we will discover in subsequent chapters. In this section we will look at two phenomena associated with liquids: surface tension and viscosity. We will also discuss the structure and properties of water.

Surface Tension. We have seen that one property of liquids is their tendency to assume the shapes of their containers. Why, then, does water bead up on a newly waxed car instead of forming a sheet over it? The answer to this question lies in intermolecular forces.

Molecules within a liquid are pulled in all directions by intermolecular forces; there is no tendency for them to be pulled in any one way. However, molecules at the surface are pulled downward and sideways by other molecules, but no upward away from the surface. These intermolecular attractions thus tend to pull the molecules into the liquid and cause the surface to behave as if it were tightened like an elastic film. Since there is little or no attraction between polar water molecules and the wax molecules (which are essentially non-polar) on a freshly waxed car, a drop of water assumes the shape of a small round bead. A measure of the elastic-like force existing in the surface of a liquid is surface tension. The surface tension of a liquid is the amount of energy required to stretch or increase the surface by unit area. As expected, liquids containing molecules that possess strong intermolecular forces also have high surface tensions. For example, because of hydrogen bonding, water has a considerably greater surface tension than most common liquids.

Another way that surface tension manifests itself is in capillary action. Figure 11.10(a) shows water rising spontaneously in a capillary tube. A thin film of water adheres to the wall of the glass tube. The surface tension of water causes this film to contract, and as it does, it pulls the water up the tube. Two types of forces bring about capillary action. One is the intermolecular attraction between like molecules (in this case, the water molecules) called ‘’cohesion’’. The other, which is called ‘’adhesion’’, is an attraction between unlike molecules, such as those in water and in the walls of a glass tube. If adhesion is stronger than cohesion, the contents of the tube will be pulled upward along the walls. This process continues until the adhesive force is balanced by the weight of the water in the tube. This action is by no means universal among liquids. In mercury, cohesion is greater than the adhesion between mercury and glass, so that a depression in the liquid level actually occurs when a capillary tube is dipped into mercury.

Viscosity. The expression ‘’slow as molasses in January’ ’owes its truth to another physical property of liquids called ‘’viscosity’’. Viscosity is a measure of a fluid’s resistance to flow. The greater the viscosity, the more slowly the liquid flows. The viscosity of a liquid usually decreases as temperature increases; thus hot molasses flows much faster than cold

molasses. Liquids that have strong intermolecular forces have higher viscosities than those that have weak intermolecular forces. Water has a higher viscosity than many other liquids because of its ability to form hydrogen bonds. Interestingly, the viscosity of glycerol is significantly higher than that of all the other liquids. Like water, glycerol can form hydrogen bonds. We see that each glycerol molecule has three-OH groups that can participate in hydrogen bonding with other glycerol molecules. Furthermore, because of their shape the molecules have a great tendency to become entangled rather than to slip past one another as the molecules in less viscous liquids do. These interactions contribute to its high viscosity.

Текст 12
The Structure and Properties of Water

Water is so common a substance on the Earth that we often overlook its unique nature. All life processes involve water. Water is an excellent solvent for many ionic compounds, as well as for other substances capable of forming hydrogen bonds with water. As Table 6.1 shows, water has a high specific heat. The reason for this is that to raise the temperature of water (that is, to increase the average kinetic energy of water molecules), we must first break the many intermolecular hydrogen bonds. Thus, water can absorb a substantial amount of heat while its temperature rises only slightly. The converse is also true: water can give off much heat with only a slight decrease in its temperature. For this reason, the huge quantities of water that are present in our lakes and oceans can effectively moderate the climate of adjacent land areas by absorbing heat in the summer and giving off heat in the winter, with only small changes in the temperature of the body of water.

The most striking property of water is that its solid form is less dense than its liquid form: an ice cube floats at the surface of water in a glass. This is a virtually unique property. The density of almost all other substances is greater in the solid state than in the liquid state.

To understand why water is different, we have to examine the electronic structure of the H2O molecule. As we saw in Chapter 9, there are two pairs of nonbonding electrons, or two lone pairs, on the oxygen atom. Although many compounds are capable of forming intermolecular hydrogen bonds, there is a significant difference between H2O and other polar molecules, such as NH3 and HF. In water, the number of hydrogen bonds about each oxygen atom is equal to two, the same as the number of

lone electron pairs on the oxygen atom. Thus, water molecules are joined together in an extensive three-dimensional network in which each oxygen atom is approximately tetrahedrally bonded to four hydrogen atoms, two by covalent bonds and two by hydrogen bonds. This equality in the number of hydrogen atoms and lone pairs is not characteristic of NH3 or NF or, for that matter, any other molecule capable of forming hydrogen bonds. Consequently, these other molecules can form rings or chains, but not three-dimensional structures. The highly ordered three-dimensional structure of ice prevents the molecules from getting too close to one another. But consider what happens when heat is provided and ice melts. There is ample evidence to show that the three-dimensional structure remains largely intact, although the bonds may become somewhat bent and distorted. At the melting point, a relatively small number of water molecules have enough kinetic energy to pull free of the intermolecular hydrogen bonds. These molecules become trapped in the cavities of the three-dimensional structure. As a result there are more molecules per unit volume in liquid water than in ice. Thus, since density = mass/volume, the density of water is greater than that of ice. With further heating, more water molecules are released from intermolecular hydrogen bonding, so that just above the melting point water's density tends to rise with temperature. Of course, at the same time, water expands as it is being heated, with the result that its density is decreased. These two processes- the trapping of free water molecules in cavities and thermal expansion- act in opposite directions. From 0 °C to 4 °C, the trapping prevails and water becomes progressively denser. Beyond 4 °C, however, thermal expansion predominates and the density of water decreases with increasing temperature.

Why do lakes freeze from top to bottom? The fact that ice is less dense than water has a profound ecological significance. Consider, for example, the temperature changes in the fresh water of a lake in a cold climate. As the temperature of the water near the surface is lowered, its density increases. The colder water then sinks toward the bottom, while warmer water, which is less dense, rises to the top. This normal convection motion continues until the temperature throughout the water reaches 4 °C. Below this temperature, the density of water begins to decrease with decreasing temperature, so that it no longer sinks. On further cooling, the water begins to freeze at the surface. The ice layer formed does not sink because it is less dense than the liquid; it even acts as a thermal insulator for the water below it. Were ice heavier, it would sink to the bottom of the lake

and eventually the water would freeze upward. Most living organisms in the body of water could not survive. Fortunately, this does not happen, and it is this unusual property of water that makes the sport of ice fishing possible. The ice layer that forms on the surface of a lake insulates the water beneath and maintains a high enough temperature to sustain aquatic life.

Текст 13
The Structure of Atom

The second hypothesis suggests that, in order to form a certain compound, we need not only atoms of the right kinds of elements, but the correct numbers of these atoms as well. The last hypothesis is another way of stating the law of conservation of mass, which says that matter can be neither created nor destroyed. Since matter is made of atoms that are unchanged in a chemical reaction, it follows that mass must be conserved as well. Dalton's brilliant insight into the matter was the main cause of the rapid progress of chemistry in the 19^{th} century.

On the basis of Dalton's atomic theory we can define an atom as the basic unit of an element that can enter into chemical combination. Dalton imagined an atom that was both extremely small and indivisible. However, a series of investigations that began in the 1850s and extended into the twentieth century clearly demonstrated that atoms actually possess an internal structure; that is they are made up of even smaller particles, which are called subatomic particles. Research led to the discovery of three such particles-electrons, protons, and neutrons.

The electron. The discovery of electrons and the first detailed study of their behavior came about with the invention of the cathode ray tube, which was the forerunner of today's television tube. Negatively charged particles, or electrons, emitted from the cathode are drawn to a positively charged plate, the anode. A hole in the anode allows electrons to pass through. The stream of electrons forms what early investigators named a cathode ray. The cathode ray goes on to strike the inside surface of the end of the tube. The surface is coated with a fluorescent material, such as zinc sulfide, so that a strong fluorescence, or emission of light, is observed when the surface is bombarded by the electrons.

The protons and the nucleus. By the early 1900s, two features of atoms had become clear: they contain electrons, and they are electrically neutral. Since it is neutral, every atom must contain an equal number of positive and negative charges, to maintain the electrical neutrality. Around

the turn of the century, the accepted model for atoms was the one that was proposed by J. J. Tomson. According to his description, an atom could be thought of as a uniform, positive sphere of matter in which electrons are embedded. In 1910 Ernest Rutherford who had earlier studied under Tomson at Cambridge University, decided to use a particles to probe the structure of atoms. Together with his associate Hans Geiger, Rutherford carried out a series of experiments in which very thin foils of gold and other metals were used as targets for A- particles emitted from a radioactive source. They observed that the majority of the particles penetrated the foil either undeflected or with only a slight deflection. They also noticed that every now and then an A-particle would be scattered (or deflected) at a large angle. In some instances, an A-particle would even be turned back in the direction from which it had come! This was a most surprising finding, for in Tomson's model the positive charge of the atom was so diffuse that the positive A-particles were expected to pass through with very little deflection. Rutherford was later able to explain the results of the A-scattering, but he had to abandon Tomson's model and propose a new model for the atom. According to Rutherford, most of the atom must be empty space. This explains why the majority of A-particles passed through the gold foil with little or no deflection. The atom's positive charges, Rutherford proposed, are all concentrated in a central core within the atom, which he called the nucleus. Whenever an A-particle came close to a nucleus in the scattering experiment, it experienced a large repulsive force and therefore a large deflection. If an A-particle traveled directly toward a nucleus, it would experience an enormous repultion that could completely reverse the direction of the moving particle.

The positively charged particles in the nucleus are called protons. In separate experiments, it was found that each proton carries the same quantity of charge as an electron and is about 1840 times heavier than the oppositely charged electron. You can appreciate the relative sizes of an atom and its nucleus would be comparable to that of a small marble. While the protons are confined to the nucleus of the atom, the electrons are conceived of as being spread out about the nucleus at some distance from it.

The Neutron. In spite of Rutherford's success in explaining atomic structure, one major problem remained unsolved. It was known that hydrogen, the simplest atom, contains only one proton, and that the helium atom contains two protons. Therefore, the ratio of the mass of a helium atom to that of a hydrogen atom should be 2:1. (Because electrons are much lighter than protons, their contribution can be ignored.) In reality,

however, the ratio is 4:1.Earlier Rutherford and others had postulated that there must be another type of subatomic particle in the atomic nucleus; the proof was provided by James Chadwick in 1932.When Chadwick bombarded a thin sheet of beryllium with A-particles, a very high-energy radiation that somewhat resembled Y-rays was emitted by the metal. Later experiments showed that the rays actually consisted of electrically neutral particles having a mass slightly greater than that of protons. Chadwick named these particles neutrons. The mystery of the mass ratio could now be explained. In the helium nucleus there are two protons and two neutrons, and in the hydrogen nucleus there is only one proton and no neutrons; therefore, the ratio is 4:1.

Текст 14
The Concept of Heat

The concept of heat is frequently confused with that of temperature. Heat is the constant motion of atoms and molecules in an object. For example, if atoms and molecules move rapidly in the air, we can say the air temperature is high or the air is hot. If, however, atoms and molecules move slowly, we can say the air temperature is low or the air is cool. In other words, heat is measured as a quantity of energy, whereas temperature describes the intensity of heat or hotness. The distinction may be made clear by considering that a lit match and a bonfire can burn at the same temperature, but a bonfire will supply more heat than a burning match. The point can also be illustrated by noting a given quantity of heat will raise the temperature of a cup of water to a higher level that it will raise the temperature of a tub of water.

Temperature can also be defined as the property that determines the direction of heat flow, in the sense that heat always flows from a body of higher temperature to a body of lower temperature. Qualitatively, a hot body has a high temperature, and a colder body has a low temperature. Quantitatively, most substances expand as they get hot. When two objects are brought together and no heat energy is lost from either object, we can conclude that the two objects are at the same temperature.

How is temperature measured? One temperature scale in common use, the Celcius scale, is obtained by placing a thermometer in melting ice and marking the point where the mercury thread stops at 0 degrees. When the thermometer is then placed in boiling water, the mercury expands and the thread moves to a new position, which is marked 100 degrees C. The

distance between these two marks is divided into one hundred equal parts. This scale is often called the Centigrade scale. The Fahrenheit scale differs in that the freezing point is marked thirty-two degrees Fahrenheit, and the boiling point is marked two hundred and twelve degrees Fahrenheit, with one hundred eighty equal divisions between them.

There is a similar situation with units used to measure the quantity of heat. Traditionally, chemists and biologists have used the calorie. This unit is the amount of heat required to increase the temperature of one gram of water to one degree on the Celcius scale. Igniting a match releases approximately five hundred calories. It is sometimes more convenient to use the kilocalorie, which, as the name implies, is equal to one thousand calories. The kilocalorie is often abbreviated as kcal. The so-called big calorie, or Calorie, used in nutrition, is actually the kilocalorie.

Текст 15
Some Developments in Metal-Cutting Materials

The efficiency of metal-cutting operations is influenced by many different factors, but one of the most important is the tool material. A very wide range of cutting materials is now available to production engineers and includes high-speed steels of various types, cast non-ferrous alloys, cemented carbides, cermets and ceramics. The latter materials are assuming increasing importance, as was evident at the Hanover machine tool exhibition last year. Another indication of the extending application of ceramic tooling is afforded by the practice of a leading West German lathe builder. It is reported that 40% of the tools used on NC machines in this company's works have ceramic tips. One of the important advantages of ceramic tips is their resistance to high temperatures, so that cutting speeds can be substantially increased. In many instances, the chips produced are at bright red heat in the zone adjacent to the point of cutting. Notable 'red hardness' is one of the characteristics of a tool alloy that is now available in this country, which is claimed also to have marked resistance to shock loads. This material is made in various grades, with differing proportions of tungsten and cobalt, and is claimed to be particularly valuable for machining 'difficult' materials. In contrast to the modern trend towards clamped-tip tooling, the alloy is fused onto the tool shank by a special process which results in a very strong bond and freedom from inclusions and cavities in the tip itself. Tools made from this alloy have been subjected to extensive testing under industrial conditions, and large scale production is to be initiated.

Various attempts have been made to improve the performance of cutting tools by surface treatments of different types. A notable example was the introduction, about four years ago, a tungsten carbide tips with a thin coating of titanium carbide-of the 0.0002 in thick. It will be appreciated that such tips are of clamped, throw-away type, since the coating would be removed by re-sharpening operations. It has been demonstrated that such coated tips can provide the significant increase in cutting life, often by a factor of two or more. A more conventional treatment for high-speed steel tools has been developed in Poland and is known as oxy-nitriding. This thermo- chemical treatment is claimed to be simple and clean to apply, and to produce a complex diffusion layer at the surface of the tool whereby the working life of a tool is increased by more than 70% on average. It will be clear that the treatment must be most effective for tools that wear on surfaces other than those that are ground during re-sharpening. Such tools include twist drills, reamers, milling cutters, hobs, gear-shaping cutters and broaches.

Текст 16
Combustion

Combustion is the scientific name for the act or process of burning. Although there are many different types of combustion, the basic process is the same: Oxygen from the air combines with a material that can burn. Heat is then produces from this reaction. If the process occurs very quickly, flames or an explosion can result. When combustion occurs under controlled conditions, it can produce useful energy. Such controlled combustion is what drives the engines that power our cars.

The role of the engine is to convert chemical energy stored in the gasoline into work. Gasoline is burned within each cylinder of an engine in a controlled fashion. This controlled combustion results in a great force which acts on a piston. The piston then turns a crankshaft which, using a rotary motion, is used to propel a car. The combustion process in the piston occurs over a four-stroke cycle. This cycle includes two up and two down movements of the piston during the combustion of a single introduction of fuel. These four strokes are: intake, compression, power, and exhaust.

As the intake stroke begins, a valve opens at the top of the cylinder which allows an air-fuel mixture to fill the expanding chamber. When the piston reaches the bottom of the intake stroke, the valve closes, trapping the air-fuel mixture inside. The upward stroke which immediately follows

compresses the mixture to about 10% of its original volume. The downward power stroke is the result of the explosion that occurs when the spark plug releases up to 30,000 volts of electricity. The force which drives the piston downward can be equal up to three tons. Finally, the cycle is completed with the upward exhaust stroke. When the piston has reached the bottom during the power stroke, the exhaust valve opens. As the piston rises in the chamber, it forces out the remaining combustion gases. When the piston again reaches the top of the chamber, it is ready to start the four-stroke cycle over again.

The ideal air-to-fuel ratio for gasoline engines in automobiles is 15:1 (fifteen parts of air to one part of fuel). A 'rich' mixture has less air and more fuel and, thus, a lower ratio (10)1). A 'lean' mixture has a higher ratio (20:1). The only time a mixture richer than 15:1 is required is when starting a cold engine. When the engine is cold, the gasoline is not vaporizing readily. By manipulating the choke, air intake is reduced. At such times, closing the choke on the carburetor provides the necessary rich mixture. To help a cold engine start easily, gasoline manufactures also produce a blend of gasoline that contains special hydrocarbons that vaporize at low temperatures. But at normal operating temperatures, a rich mixture wastes fuel, fouls the spark plugs, and causes pollution. A lean mixture can be even more costly in the long run, since it can cause the valves and pistons to burn, warp, and even crack.

Текст 17
N Rays Show What X Rays Can't

Problem: You are testing an explosive bolt for an Apollo spacecraft. If it isn't properly packed with explosive material, it won't do its job of unhitching the rocket stages in space. But the lead jacketed bolt is impervious to X-rays. How do you find out whether it will work without actually exploding it? Solution: Use N-rays (thermal or low energy neutrons) instead of the x-rays. X-rays have limitations. They are absorbed by such heavy elements as lead, iron, and uranium, so that it is impossible to see through such materials with them.

Thermal neutrons, on the other hand, behave in exactly the opposite way. They are absorbed much more by light materials – those containing hydrogen, lithium, and boron, for example, - than by heavy ones. Thus, the two techniques compliment each other beautifully, and neutron radiography is now coming to the rescue in fields as diverse as aerospace and biological research.

Why the difference in behavior? X-rays are electromagnetic radiation, which is weakened by interaction with the outer clouds of electrons orbiting the atomic nucleus. The heavier the element (the higher the atomic number), the denser is the atomic cloud, and the harder it is for X-rays to penetrate. Neutrons, however, are uncharged, fairly heavy particles. Thermal neutrons can breeze through electron clouds relatively unaffected, but are absorbed by interactions within the nucleus that depend on the exact makeup of each individual nucleus, and not directly on the atomic number. This property of variable absorption also makes N-rays valuable for elements between the extremes of high and low atomic number. Cadmium, for example, has very high neutron attenuation; neutrons could be a useful method of inspecting cadmium plating for uniformity. Radiographically differentiating between neighboring materials such as iron and cobalt, elements number 26 and 27, would be difficult with X-rays. Yet these elements, and even different isotopes of them, can be distinguished because they absorb N-rays very differently.

This is the most important in the nuclear industry, for example, where you must differentiate between normal uranium (primarily uranium-238) and the enriched fuel material used in modern reactors, uranium-235. Another attractive advantage of neutron radiography in the nuclear industry is that highly radioactive material can easily be radiographed with neutrons without the film fogging problems common to an X-rays examination. This can be done because there are methods for detecting neutrons that are essentially insensitive to the gamma radiation emitted by a radioactive object such as a cobalt-60 source used for radiography or medical therapy, or a reactor fuel element that has been irradiated for some time in a reactor.

Текст 18
From Classical Physics to Quantum Theory

Attempts by nineteenth-century physicists to understand atoms and molecules met with only limited success. By assuming that molecules behave like little rebounding balls, those early physicists were able to predict and explain some macroscopic phenomena, such as the pressure exerted by a gas. However, the same model could not account for the stability of molecules; that is, it could not explain the forces that hold atoms together. It took a long time to realize – and an even longer time to accept – that the properties of atoms and molecules are not governed by the same laws that work so well for larger objects.

It all started in 1900 with a young German physicist named Max Planck. While analyzing the data on the radiation emitted by solids heated to various temperatures, Planck discovered that atoms and molecules emit energy only in whole-number multiples of certain well-defined quantities. Physicists had always assumed that energy is continuous, which meant that any amount of energy can be released in a radiation process. Planck's work, however, showed that energy can be released only in certain definite amounts, called quanta. The resulting quantum theory turned physics upside down. Initially the scientific community greeted Planck's theory with skepticism. The idea was so revolutionary that Planck himself was not entirely convinced of its validity: he spent years looking for alternative ways to explain the experimental findings. Eventually, however, the scientific community came to accept the quantum theory, and physics was never the same.

In the development of science, a single major experimental discovery or the formulation of one important theory often sets off an avalanche of activity. Thus, in the thirty years that followed Planck's introduction of the quantum theory, a flurry of investigations not only transformed physics but also altered our concept of nature. To understand Planck's quantum theory, we must first know something about the nature of radiation, which is the emission and transmission through space of energy in the form of waves. There are many kinds of waves, such as water waves, sound waves, and light waves. In 1873 James Maxwell showed theoretically that visible light consists of electromagnetic waves. According to Maxwell's theory, an electromagnetic wave has an electric field component and a magnetic field component. We now know that light behaves like electromagnetic radiation, which is the emission of energy in the form of electromagnetic waves. Figure 7.4 shows various types of electromagnetic radiation, which differ from one another in wavelength and frequency. The long radio waves are emitted by large antennas, such as those used by broadcasting stations. The shorter, visible light waves are produced by the motions of electrons within atoms and molecules. The shortest waves, which also have the highest frequency, are those associated with gamma-rays, which result from changes within the nucleus of the atom. As we see, the higher the frequency, he more energetic the radiation. Thus, ultraviolet radiation, X-rays, and gamma rays are high-energy radiation.

In 1900, Planck solved the problem with an assumption that departed drastically from accepted concepts. Classical physics had assumed that atoms and molecules could emit or absorb any arbitrary amount of radiant

energy. Planck said that atoms and molecules could emit or absorb energy only in discrete quantities, like small packages or bundles. Planck gave the name quantum to the smallest quantity of energy that can be emitted or absorbed in the form of electromagnetic radiation. The idea that energy should be quantized or "bundled' in this manner may seem strange at first, but the concept of quantization has many analogies. For example, an electric charge is also quantized; there can be only whole-number multiples of 'e', the charge of one electron. Matter itself is quantized, for the numbers of electrons, protons, and neutrons and the numbers of atoms in a sample of matter must also be integers. Our money system is based on a "quantum" of value called a penny. Even processes in living systems involve quantized phenomena. The eggs laid by hens are quantized, and pregnant cats give birth to an integral number of kittens, not to one-half or three-quarters of a kitten.

Текст 19
Properties of Aqueous Solutions

It will be useful to have some knowledge about the medium in which reactions take place because many important chemical reactions and virtually all biological processes take place in an aqueous environment. Thus it is also important to consider the properties of water solutions. We begin by defining some useful terms.

A solution is a homogeneous mixture of two or more substances. The substance present in smaller amount is called the solute, while that present in larger amount is called the solvent. A solution may be gaseous such as air, solid such as an alloy, or a liquid such as sea water, for example. But we will discuss only cases in which the solute is a liquid or a solid and the solvent is water – that is, aqueous solutions.

All solutes in aqueous solution can be divided into two categories: electrolytes and non-electrolytes. An electrolyte is a substance that, when dissolved in water, results in a solution that can conduct electricity. A non-electrolyte does not conduct electricity when dissolved in water. Figure 3.2 shows an easy and straightforward method of distinguishing between electrolytes and non-electrolytes. A pair of platinum electrodes is immersed in a beaker containing water. To light the bulb, electric current must flow from one electrode to the other, thus completing the circuit. Pure water is a very poor conductor of electricity. However, if we add a small amount of an ionic compound such as sodium chloride (NaCl), the bulb

will glow as soon as the salt dissolves in the water. When solid NaCl dissolves in water, it breaks up into Na+ and Cl- ions. The movement of Na+ ions toward the negative electrode and Cl- ions toward the positive electrode is equivalent to the flow of electrons along a metal wire. In this way a solution containing an electrolyte is able to conduct electricity. Thus, we can say that NaCl is an electrolyte.

Comparison of the light bulb's brightness for the same molar amounts of dissolved substances helps us distinguished between strong and weak electrolytes. Ionic compounds such as sodium chloride (NaCl), potassium iodide (KI), and calcium chloride (CaCL2) are strong electrolytes. A characteristic of strong electrolytes is that the solute is assumed to be 100 percent dissociated into ions in solution. By dissociation we mean the splitting of the compound into cations and anions. Water is a very effective solvent for ionic compounds. It is often referred to as a polar solvent. Although water is an electrically neutral molecule, it has a positive end (the H atoms) and a negative end (the O atom), or positive and negative "poles". When a substance such as sodium chloride dissolves in water, the three-dimensional network of the ions in the solid is destroyed, and the Na+ and Cl- ions are separated from each other. In solution, each Na+ ion is surrounded by a number of water molecules orienting their negative ends toward the cation. Similarly, each Cl- ion is surrounded by a number of water molecules with their positive ends oriented toward the anion.

Two other classes of compounds, acids and bases, are also electrolytes. Certain acids such as nitric acid, for example, are strong electrolytes. They share the common characteristic of ionizing completely when dissolved in water. Substances that dissolve in water as neutral molecules rather than ions are non-electrolytes because their solutions do not conduct electricity. Various sugars and alcohols are examples of non-electrolytes. It is interesting to note that the human body fluid consists of many strong and weak electrolytes.

Текст 20
Gravimetric Analysis

A precipitation reaction is characterized by the formation of an insoluble product, or precipitate. A precipitate is an insoluble solid that separates from the solution. Precipitation reactions usually involve ionic compounds. In order to be able to predict whether a precipitate will be

formed when two solutions are mixed or when a compound is added to a solution, we need to know the solubility, that is, the maximum amount of solute that can be dissolved in a given quantity of solvent at a specific temperature. Thus precipitation reactions form the basis of a useful procedure in chemical analysis called gravimetric analysis.

Gravimetric analysis is an analytical procedure that involves the measurement of mass. One type of gravimetric analysis experiment involves the formation, isolation, and mass determination of a precipitate. This procedure is most often used with ionic compounds. A sample substance of unknown composition is dissolved in water and then converted into a precipitate by allowing it to react with another substance. The precipitate formed is filtered off, dried, and weighed. Knowing the mass and chemical formula of the precipitate formed, we can calculate the mass of a particular chemical component, that is, the anion or cation of the original sample. From the mass of the component and the mass of the original sample, we can determine the percent composition by mass of the component in the original compound.

Two points regarding gravimetric analysis should be mentioned. First, this is a highly accurate technique, since the mass of samples can be measured accurately. Second, this procedure is applicable only for reactions that go to completion, or have nearly 100 percent of yield. Note that gravimetric analysis does not establish the whole identity of the unknown substance. Thus, we cannot know what the cation is. However, knowing the percent by mass of substance greatly helps us in narrowing the possibilities. Because no two compounds containing the same anion or cation have the same percent composition by mass, comparison of the percent by mass obtained from gravimetric analysis with that calculated from a series of known compounds would reveal the identity of the unknown. In cases where the identity of the original compound is known, the gravimetric analysis technique allows us to determine the concentration of the solution containing the compound.

Текст 21
Corrosion

Corrosion is the term usually applied to the deterioration of metals by an electrochemical process. We see many examples of corrosion around us – iron rust, silver tarnish, the green patina formed on copper and brass. Corrosion causes enormous damage to buildings, bridges, ships, and cars.

One estimate put the cost of metallic corrosion to the U.S. economy in 1984 at about 80 billion dollars, or 3 percent of the gross national product for that year!

By far the most familiar example of corrosion is the formation of rust on iron. Oxygen gas and water must be present for iron to rust. Although the reactions involved are quite complex and not completely understood, the main steps are believed to be as follows. A region of the metal's surface serves as the anode, where oxidation occurs. The electrons given up by iron reduce atmospheric oxygen to water at the anode, which is another region of the same metal's surface. Note that this reaction occurs in an acidic medium. The hydrated form of iron oxide is known as rust. The electric circuit is completed by the migration of electrons and ions; this is the reason that rusting occurs so rapidly in salt water. In cold climates, salts, spread on roadways to melt ice and snow, are a major cause of rust formation.

Metallic corrosion is not limited to iron. Consider aluminum, a metal used to make many useful things, including airplanes and beverage cans. Aluminum has a much greater tendency to oxidize than iron does. Based on this fact alone, we might expect to see airplanes slowly corrode away in rainstorms, and soda cans transformed into piles of corroded aluminum. These processes do not occur because the layer of insoluble aluminum oxide that forms on its surface when the metal is exposed to air serves to protect the aluminum underneath from further corrosion. The rust that forms on the surface of iron, however, is too porous to protect the underlying metal. Coinage metals such as copper and silver also corrode, but much more slowly. In normal atmospheric exposure, copper forms a layer of copper carbonate, a green substance also called patina that protects the metal underneath from further corrosion. Likewise, silverware that comes into contact with foodstuffs develops a layer of silver sulfide.

A number of methods have been devised to protect metals from corrosion. Most of these methods are aimed at preventing rust formation. The most obvious approach is to coat the metal surface with paint. However, if the paint is scratched, pitted, or dented to expose even the smallest area of bare metal, rust will form under the paint layer. The surface of iron metal can be made inactive by a process called passivation. A thin oxide layer is formed when the metal is treated with a strong oxidizing agent such as concentrated nitric acid. A solution of sodium chromate is often added to cooling systems and radiators to prevent rust formation. The tendency for iron to oxidize is greatly reduced by alloying

with certain other metals. For example, when iron is alloyed with chromium and nickel to become stainless steel, the layer of chromium oxide that is formed protects the iron from corrosion. An iron container can be covered with a layer of another metal such as tin or zinc. A “tin” can is made by applying a thin layer of tin over iron. Rust formation is prevented as long as tin layer remains intact. However, once the surface has been scratched, rusting occurs rapidly. If we look up the standard reduction potentials, we find that iron acts as the anode and tin as the cathode in the corrosion process.

The protective process is different for zinc-plated or galvanized iron. Zinc is more easily oxidized than iron. So, even if a scratch exposes the iron, the zinc is still attacked. In this case, the zinc metal serves as the anode and the iron is the cathode. Cathodic protection is a process in which the metal that is to be protected from corrosion is made the cathode in what amounts to an electrochemical cell. For example, an iron nail can be protected from rusting by connecting the nail to a piece of zinc. Without such protection, an iron nail quickly rusts in water. Rusting of underground iron pipes and iron storage tanks can be prevented or greatly reduced by connecting them to metals such as zinc and magnesium, which oxidize more readily than iron.

Раздел IV. НАУЧНО-ПОПУЛЯРНЫЕ ТЕКСТЫ

Текст 1
The Media

By the history of communication media I simply mean the history of the technical means by which absent and/ or abstract events, experiences, ideas become symbolically represented, "fixed" into an accepting material, and thus conserved through time as well as space. Although the topic is largely sociological, it is also extremely deep and infinitely ancient, for the secret of life itself is wrapped up in the mystery of genetic encoding and in the replication and motility of molecules which orchestrate each other's activity. Genes are information; molecules are media as well as motors, so to speak.

Our story best begins with man's conscious co-option of the physical environment for his own informational and communicational uses. Not every part of the natural world will do, but specifically those parts which are blank themselves and that best receive markings- such as sand, wood, bark, bone, stone, and the human body. These markings were for the purpose of preserving and delivering messages. They were signs, not unlike spoors, tracks, or tell-tale colors of vegetation or sky, but now rendered intentional, between man and man, and man and his descendants.

The step that followed was inspired: to begin to produce the medium, to create smooth plastered walls, thin tablets, and papyrus, and to reduce the labour of marking which was required- such as carving, chiseling- to the deft movement of a pigmented brush or stylus. As society elaborated itself and as the need to keep records and to educate grew, it became more efficient first to shrink and conventionalize the symbols themselves, from pictograms into phonetic alphabets, then to crowd these markings into rows and layers, and then into "paper-thin" scrolls and stacks.

At this early stage already, we can see a double movement: 1) towards the dematerialization of media and 2) towards the reification of meanings. All that remains to us of the ancient world is some writing and painting and sculpture and architecture: solid and material objects, all. But it would be wrong to underestimate the vaster traffic of information in more ephemeral media that sustained day-to-day life- from scratched clay tablets and bark shards, to graffitied walls, counters, and papyrus cloths, from diagrams in the sand to banners in the wind. Myriads gestures, demonstrations, performances, and of course, the babble of song, gossip,

rumor, and instruction continuously filled the air. The sounds of every century before this one are gone forever, as well as almost all of the sights that together constituted the medium of social interchange.

Текст 2
Ocean 'Layer Zero' Valued

For seismic contractors, the water between the surface and the seafloor is primarily an obstacle that must be overcome. For some scientists, however, that same water is a target of opportunity- a chance to better understand the very nature of oceans themselves- and seismic reflection data may help unlock the secrets of ocean processes. A new application for seismic reflection profiling is allowing scientists to “see” layers in the oceans, which provides new insight on the structure of the ocean currents, eddies and mixing processes.

This recent collaboration by geophysicists from the University of Wyoming and oceanographers from Woods Hole Oceanographic Institute to apply seismic data to oceans could be a major step forward in the ability to remotely survey the interior of oceans. Raymond Schmitt, the senior scientist in the department of physical oceanography at Woods Hole, said that early research suggests seismic data can be used to:

– Create detailed pictures of eddies, internal waves and other ocean features that affect climate, fisheries and the spread of pollution.

– Help scientists locate yet-undiscovered mixing sites, which may improve understanding of how the ocean absorbs heat and moves it from the equator to the points.

– Help in improving climate models.

Serendipity intervened in the summer of 2000 when Steven Holbrook, a professor of geophysics with the University of Wyoming, as on a National Science Foundation-funded cruise acquiring data to study the deep crustal structure of the continent-ocean transition in the Newfoundland Basin near Grand Banks off Newfoundland. The program included three long transects that directly crossed the climatological path of the North Atlantic current- and during acquisition the scientists noticed some unusual echoes coming from the water. Then, in the fall of 2002, the Wyoming group noticed similar reflections from the water column in the Gulf of California- so they decided to process the data with special attention paid to the water column. Analysis of shot and common midpoint gathers showed that the energy represents primary reflections rather than

multiples, refractions or diffractions. Reflections are visible at zero offset, show hyperbolic move-out, asymptotically approach the direct water wave and are consistent from shot to shot. The team then created conventional stacks of these reflections, including velocity analysis, filtering and median stacking. All show striking images of reflectance in the water column. Holbrook said the group is confident that, at least in the images from the upper 1,000 meters of the Newfoundland Basin, the reflections come from the boundaries between layers with contrasting temperature/salinity properties.

Reflection seismic technology was never considered as a technique for studying the oceans because ocean acousticians typically use much higher frequencies of many tens to hundreds of kilohertz to look at scattering from upper ocean microstructure or zooplankton, which are not the same phenomenon the University of Wyoming scientists saw, according to Holbrook. Of course, like any good scientists, the group needed independent corroboration of these results. Previous oceanographic work in the region shows strong intrusions between the North Atlantic current and the Labrador current very near the site of the strong seismic reflections. The images appeared to be of intrusions- or masses of water of similar density but of contrasting temperature and salinity- that Schmitt had measured in the region more than 20 years before. A comparison of the predicted sound speed profile and the stacked seismic reflection showed a close match, which confirmed that the low frequency sound energy was reflecting off the gradients in physical properties in the water column.

Two aspects of seismic reflection profiling make it attractive as a survey tool for oceanic water column structure. The acoustic echoes are obtained throughout the whole water column and the lateral spacing of the returns is only about 20 feet, making it easy to track the horizontal extent of reflecting features. (Most traditional water column data are collected by repeated lowerings of towed instrument packages, which limits the depth range to a few hundred meters, with 500 to 1,000 meter or 1,500 to 3,300 feet spacing between profiles.) The technique allows rapid surveys of ocean structures that change more quickly than traditional methods can observe.

Текст 3
Technology and Modern Society

Technology has always played an important role in human society. We talk about epochs such as the Stone Age, The Bronze Age, or the Iron

Age, illustrating that the most important characteristics of these periods were the materials technologies in use. In modern times our reliance on technology is increasing, and it is appropriate to say that today we stand on the threshold of the Information Age.

The 20th century has been very strongly influenced by three major inventions all conceived around 1870. We mean the Otto engine, which powers our cars, the telephone and electricity generation. Most other products prior to modern electronics are either derivatives of or supplements to these major inventions. It is not unreasonable to assume that the 21st century in the same way will be dominated by technology based on two major inventions made almost exactly 100 years after the invention of the car engine, the telephone and electricity generation. Those two inventions are the semiconductor chip and the optical fiber. The transistor, on which our electronic chips are based, was invented in 1948. It was followed by the first small-scale integrated circuit about 10 years later. The first really large-scale integrated circuit appeared around 1970, at the same time as the optical fiber was invented. Considering that only 20 years have elapsed since these two major microelectronic components appeared, their influence on society has been remarkable. Computers are to be found everywhere, and telecommunications are already reshaping most business activities from banking to retail and industrial manufacturing.

Although the title of this essay refers to telecommunications alone, it would be impossible to isolate the effects of communication as such from the effects of data processing and storage and other uses of microelectronic technology. The systems we now see evolving are networks where data transfer, storage and processing take place in a distributed manner. Isolating one technology from the other becomes impossible. Looking at an industrialized country it is tempting to say that the Information Age is already here. We already depend on computer networks. It could also be argued that modern society moves and evolves at an accelerating pace. Whereas it took (perhaps) 80 years for the inventions of the 1870s to reach their full societal impact, the inventions of the 1970s only needed 20 years.

Текст 4
Urban Culture: The American City

Three hundred years ago a handful of town dwellers lived in a few scattered locations along the Atlantic coastline of what is now the United States. Today, however, the United States is a nation of urban dwellers.

Almost 80 percent of the national population lives either within the formal boundaries of cities or in the huge suburban rings (clusters of communities socially and economically connected to the cities) which surround them. More than two hundred of these metropolitan regions now make up the everyday setting of America life.

The influence of cities in modern America is extensive. Thanks in part to urban-based national news media, in a country in which only two people of 100 now live on farms, the power of cities to influence life far beyond their borders is very great. From urban centers, through suburban communities, into the smallest and the most distant rural villages flow many social and economic values, ways of making a living, clothing styles and manners and a modern technological spirit. As a result, many of the once sharp distinctions that could be made between rural and urban ways of life no longer exist. The geography may differ between city and country, and social and political attitudes may still vary, but the forms of living and working are remarkably similar.

The original North American colonies were regarded by the mother countries of Britain, Holland and France primarily as sources of raw material from field, forest, ocean and mine, and as potential markets for finished goods manufactured in Europe. While this approach required rural and wilderness settlement, it was necessary, at the same time, to establish small towns in the colonies as administrative centers to control the emerging trans-Atlantic trade. These towns were gathering places for artisans and shopkeepers who served the agricultural hinterlands. In the large and frightening wilderness, the towns provided security and also served as social centers. Eventually, with increasing numbers of European settlers arriving in the New World, coastal cities-the largest of which were Boston, New York, Philadelphia and Charleston, South Carolina-came into being, and their economic and social influence stretched into extensive rural backlands. At the same time, as port cities, they rapidly grew to be flourishing centers of international commerce, trading with Europe and the Caribbean.

By the 1750, the larger cities were dominated by a wide range of commercial and craft activities. A corresponding range of social groups developed: from an economically and socially dominant merchant and administrative class to a middle class of artisans, shopkeepers, farmers and smaller traders. On the edge of society, groups of the poor and dispossessed scrambled for an economic foothold, and were sometimes dependent upon charity. Culturally, the colonies were outposts of Britain.

The colonial cities were visited by touring actors and musicians and enriched by the development of schools, libraries and lecture halls. All of this increased the differences between city and country life and contributed to the importance of the American city as an initiator of social change. In terms of administration, the development of towns created a dense web of social, economic and governmental structures and regulations. However, the forms of municipal government varied greatly from place to place. In New England, the town meetings prevailed. This was a gathering of all citizens to discuss common concerns, and was an outgrowth of Protestant leader John Calvin's ideas about providing for representative government in a religious community. This form of community government continues today in the small towns of the Northwest.

Most American towns of this early period featured open spaces alternating with build-up areas. Much free land was available, and, as fewer than 10 percent of the people lived in the towns, few opposed their growth. By the middle of 18th century, however, many people opposed this growth because the towns had begun to seem too large and crowded. William Penn, who planned the city of Philadelphia, believed that a well-ordered city was necessary to economic growth and moral health. He wanted to build a "green country town" which would not be sharply cut off from the surrounding forest and farmlands. Inside the town were markets, residential housing, small factories, churches, public buildings, recreational areas and parks. Farming areas would be on the periphery but close enough to be accessible to the city dwellers. Penn's ideas were widely copied in his day. An echo of them can be heard in contemporary planned communities which preserve parks and open spaces within a town's boundaries.

Текст 5
A Merging Metropolis

By 1990, strong economic and social currents had encouraged the continued concentration of the urban population which otherwise might disperse into more sparsely settled areas. The creation of large metropolitan markets for goods, services and jobs acts as a magnet for further growth. In addition, as farming has become more mechanized over the last half century, increasing numbers of unneeded farm workers have followed those who earlier sought better lives in urban areas. There are many activities which can only thrive in central locations with large populations. These include manufacturing, business and government

administration, large-scale cultural and retail activities, and a whole host of service occupations.

The growth of American cities between 1860 and 1960 has always been viewed in the United States with feelings of both pride and dismay. The city is a product of the machine age; it is a creation of the industrialization which produced much of the country's wealth and strength. Much that is best and most innovative in education, culture, and political and social thought results from intellectual exchange and excitement which city life makes possible. On the other hand, poverty, overcrowding, social conflict and criminal violence are also much more common in cities than in rural areas. Demands for social services which go beyond the ability of the cities to provide have, over time, created problems which make living in the cities less attractive. The response of many city dwellers has been to relocate from the city center to less heavily populated areas at the edge of the city. These areas, known as "suburbs", have combined elements of both urban and rural living, and have blurred the dividing line between city and countryside. Many business and manufacturing firms have moved to these suburbs, attracted by lower taxes, low land prices, and the growing labor pool and retail markets there. Older distinctions between city and suburb, central business district and suburban shopping area, and even city slum and single home residential district are not very useful today. This is because these places are no longer relatively independent: the suburban rings around all central cities must be regarded as part of the urban structure. Central cities and their suburbs together form metropolitan regions and must be considered economic and social wholes. Highways have been constructed to make travel from city to suburb easier, and the provision of social services has been extended, so that living in a suburb is nearly as convenient as living in a city, and yet the problems of overcrowding and crime are much less serious. Also as a result of the expansion of these suburban rings, many metropolitan areas have grown so large in recent decades that they have overlapped, and have begun to merge. This new urban network has been called "megalopolis" by French geographer Jean Gottman. He identified the largest of these as occupying an area on the Atlantic seaboard from north of Boston, through New York, south to Washington, D.C.-"Bosnywash". This megalopolis contains more than one-sixth of the entire United States population; it is bound together by many economic and social relationships.

As many of America's urban dwellers have moved to the suburban rings in search of greater privacy, cleaner air and less social conflict, a

pattern of urban living has emerged which is in sharp contrast to that in cities in other industrialized countries. Elsewhere in the world because of the advantages which city life can offer, city centers-or inner cities-are regarded as the most desirable living space and are occupied by the most affluent groups. In the United States, many in the wealthy and the middle class have moved to the periphery. As a result, cities have lost tax money that these groups paid to provide needed services. The lessening of services further encourages those who can afford to move outside the city limits to do so, and the city centers are perceived as among the least desirable areas to live. This does not mean that those areas are unoccupied. It means that, because of the low rents, newly arrived groups, the members of which are the least educated, less skilled, poorest and least adapted to urban life, move first into the most undesirable living space near the center of the city. An important source of urban population growth, especially since 1945, has been the migration to cities of black Americans and Hispanics. Unfortunately, their migration occurred when economic changes were causing a loss of jobs, many to other countries. The consequence is that all the larger American cities have experienced an increase of relatively unskilled, poor people for whom jobs are not readily available. However, as these people gain skills, get jobs and become more affluent, they, in turn, move outward and their places are taken by a less affluent and more rootless population.

There are only general tendencies and there are many exceptions. For example, during the past two decades cities such as New York, Boston, Baltimore, Washington, D.C. and San Francisco have accomplished major "urban renewal" projects, rebuilding and renovating huge tracts of the central city area, and thus once again attracting business and more affluent groups to settle there. In many cities young middle class business and professional families have returned to deteriorating neighborhoods and restored the economic and cultural vitality of the areas. Though it probably represents only a minority trend, this is a hopeful sign for the American cities.

Текст 6
Nuclear Energy

One of the most spectacular- and controversial- achievements of the United States science and technology has been the harnessing of nuclear energy. This achievement was based on scientific concepts developed since the beginning of the 20th century. The idea of nuclear fission can be traced

back to the work of Lord Rutherford and Frederick Soddy between 1901 and 1906. The two British scientists studied the makeup of the atomic nucleus and concluded that a great store of energy was locked in each nucleus. Soddy suggested that someday that enormous energy might be released. Fear that such an atomic war might occur swept through the international scientific community in 1938. Word leaked out that German scientists Otto Hahn and Fritz Strassmann had split a uranium nucleus by bombarding it with subatomic particles. Other nuclear physicists soon realized the significance of this event. In such a reaction, the splitting of each nucleus would release particles to split other nuclei. The result would be a tremendous release of energy. Albert Einstein, Enrico Fermi and others concluded that a nuclear chain reaction was achievable. But Einstein and Fermi had fled to the United States to escape persecution in National Socialist Germany and Fascist Italy. And they feared that the Nazis would develop an atomic bomb. Einstein explained that the element uranium might be turned into a great source of energy. He warned that extremely powerful bombs of a new type may thus be constructed. This warning led to the Manhattan Project- the United States' effort to build an atomic bomb. Milestones in this effort included achievement of the world's first self-sustaining nuclear chain reaction by Enrico Fermi at the University of Chicago in December 1942. Another milestone was the explosion of the first atomic bomb at Trinity Site, New Mexico, on July 16, 1945.

But new developments in science and technology often trigger opposition. Opposition to nuclear power has been a very different story. The first commercial atomic power plant started operation in Illinois in 1956. At that time it was widely predicted that nuclear power plants would supply nearly all of the nation's electricity by the 1980s. That did not happen. Opposition to the construction of nuclear plants has tended to increase rather than decrease. Safety and environmental considerations have kept construction costs high. As a result, nuclear power has not been able effectively to compete with other power sources in the United States. During the 1970s and 1980s, plans for several power plants were cancelled. Some plants under construction were abandoned and a few existing plants were closed. Much of the American opposition to nuclear power is based on environmental and personal safety concerns. On top of that, Americans emotionally link nuclear power to nuclear weapons and to the great scientific effort that produced them both.

Since World War 2, Americans have debated the benefits of scientific progress. On one hand, science and technology have given Americans a high standard of living, greater longevity than ever before and

exciting achievements in space exploration. Various successes in developing peaceful uses of atom-nuclear power, nuclear medicine and a new understanding of physics-have demonstrated man's creative use of this scientific breakthrough. On the other hand, science and technology have produced the dangers of radioactivity, toxic wastes, environmental disruptions and the threat of nuclear weapons. Americans are responding to these concerns on a variety of fronts, including international arms control negotiations, environmental protection laws, development of long-term disposal sites in remote areas for nuclear wastes and creation of a "Superfund" program to clean up dangerous chemical waste sites that threaten health.

Текст 7
Toward The Future

Each new idea, each new development in science leads to many others. The pace of scientific and technological progress appears to speed up all the time. New inventions appear and quickly make hundreds of existing devices and procedures obsolete. An example is the laser-light amplification by stimulated emission of radiation. Today, the intense, directional, coherent (not scrambled) energy of a laser beam is used to cut through diamonds and steel. As surgical tools, lasers are used to repair damaged eyes and cut away brain tumors. By focusing enormous energy on a very small area, lasers can trigger unusual chemical reactions. Because laser light does not spread and scatter like "ordinary" light, laser beams can carry information over tremendous distances. Laser light has been beamed from the earth to the moon and back again. Laser devices are revolutionizing image making, printing, copying and the recording and playing of music. Studies are under way to use lasers as the ultimate defense against a missile attack.

Two of the most exciting current scientific developments are the human genome project and the superconducting collider. The human genome project, which will take at least 15 years and cost $3 billion, is an attempt to construct a genetic map of humans by analyzing the chemical composition of each of the 50,000 to 100,000 genes that make up the human body. But even while this enormous undertaking is in progress, scientists are using knowledge about human genes to treat diseases, such as cancer. Scientists hope that additional knowledge about human genes will lead to more effective treatments for many diseases.

The superconducting super collider is an attempt to learn more about the building blocks that make up atoms. Scientists use machines called accelerators to speed protons or electrons (parts of atoms) close to the speed of light. When these particles collide, the scientists study their interactions. The Super collider, which is expected to be in operation in the late 1990s, will achieve speeds 20 times higher than those possible today. Scientists hope it will allow them to learn more about the composition of the smallest particles of atoms-particles known as "quarks".

New developments can also have dangerous side effects. The development of nuclear power, pesticides and the plastics industry introduced serious hazards into the environment that must be treated. American scientists, policymakers and concerned citizens are now aware that new developments can have hidden dangers. Therefore, part of any scientific effort to develop new products includes an effort to detect, prevent or control any hazards. Science and technology today, in the United States and throughout the world, are creating new worlds. And it is the responsibility of all people, as well as scientists, to make sure that these new worlds represent a genuine improvement in the quality of life for human beings everywhere.

Текст 8
Chemistry Today

As recently as thirty years ago, the word ''chemist'' conjured up visions of someone in a white coat ,working busily in the laboratory, with test tubes and beakers in hand and Bunsen burners aglow. This image, dear to the hearts of film makers, is outdated. Great advances made during the last few decades have transformed chemistry. The science of chemistry can still be defined as the study of the materials that make up the universe and the changes these materials undergo. But not all chemists today work in laboratories full of bubbling solutions, and we can no longer describe what a chemist does in just a few words. For example, a chemist may develop new drugs or agricultural chemicals, measure the speed of chemical and biological reactions, or probe the structure and functions of protein molecules. Some chemists don't even wear white coats or spend much time in the laboratory making solids appear miraculously from solutions. Today's chemist may spend at least part of his or her time sitting before a computer studying molecular structure and properties, or using sophisticated electronic equipment to analyze pollutants from auto

emissions or toxic substances in the environment. In fact, chemistry is so diversified that a person would no longer say simply,' I am a chemist'. He or she would be identified as for example, an analytical chemist, a physical chemist, an inorganic chemist, a biochemist, an organic chemist, an agricultural chemist, or an environmental chemist.

Some science historians believe that the word 'chemistry' derives from the Greek word chemeia, earning 'the art of metalworking'. Obviously, modern chemistry involves a great deal more than this. Chemistry has become an interdisciplinary science, and today no scientific work can escape chemistry. Many of the frontiers in medicine and biology are being explored at the level of atoms and molecules, which are the tiny bits of matter on which the study of chemistry is based. Chemists are now involved in the design and synthesis of drugs to treat a variety of diseases and to combat cancer. In addition, there is great public and governmental concern with keeping our environment clean and with finding new sources of energy. Such problems can be solved only by the inventive application of what we know about the chemistry of the systems involved. And most industries, whatever their products, are dependent on the work of chemists. For example, through years of research, chemists have learned to manufacture polymers (molecules that contain thousands of atoms) of various sizes and shapes that are used in the clothing, cooking utensils, and toys in our households. Chemists devise new products and better ways to make old ones. They monitor the composition of raw materials that enter a manufacturing plant and check the quality of the finished product that goes out.

As with any discipline, we must learn the necessary vocabulary before we can begin to understand and appreciate how the principles of chemistry are applied to practical systems. The first 12 chapters of this book provide the basic definitions in chemistry, as well as the tools we will need to study the quantitative relationships in chemical reactions, the structure and properties of atoms and molecules, and the forces responsible for the existence of gases, liquids, and solids. Once we have acquired a basic knowledge of chemistry, we can take a closer look at many different topics dealing with the physical and chemical properties of matter. Throughout this book we will see that chemistry, by virtue of its interdisciplinary nature, is concerned with subjects ranging from the synthesis of ammonia, the cracking of petroleum, the depletion of the ozone in the stratosphere, high-temperature superconductors, and the understanding of biological processes to dental filling, lasers, photography and even ice skating.

Текст 9
Cars Switch onto Plugged – in Power

Around the world governments and their citizens are becoming increasingly concerned about what the motor car and its internal combustion engine do to the air we breathe. In some cities air pollution resulting from the internal combustion engine is so bad that drastic action has had to be taken. In summertime, pollution in some southern European cities is now so serious that it is common for half the usual number of commuters to be forbidden to bring their cars into the city.

Calculating the number of people who become unwell or even die as a result of air pollution is very difficult. But recent studies of the effects of car fumes suggest that the health risks may be more severe than previously thought. Suddenly, urban air pollution is no longer a subject just for environmentalists but a cause of widespread public concern. Ordinary people are beginning to sit up and take notice.

There are numerous proposed ways of dealing with the problem: one of the most radical is to slowly stop using the internal combustion engine and to instead the electric motor powered from a large battery pack. A lot of money is now being invested by car and battery manufactures to create 'clean' vehicles. Much of the pressure has come from the land where the car is king- California. The united States has no public transport to speak of (the major car-makers actively contributed to its destruction) so the car is the average American's only practical means of daily transport. But some US cities, Los-Angeles in particular, are paying a high price for this over-reliance. LA's famous smogs -trapped by the natural 'bowl' of the nearby mountains- are the result of reactions between the chemicals which come from the city's millions of car exhausts.

Because of this serious pollution problem, California has for over 20 years set tough pollution laws. Even so, La's smog problem has not been solved. So now, the 'sunshine state' has taken the first step towards removing the internal combustion engine altogether from its roads. From 1998, all car-makers who sell their cars in California will have to offer a proportion of electric cars for sale. In 1998 the proportion of electric cars offered must be two per cent, rising to five per cent by 2003 and to ten per cent by 2005.

Environmentalists argue, with some justification, that only by making laws like this can politicians force to change on the car industry. But others –some of them no less committed to cleaner urban air- doubt

that the totally electric car is the right solution to the problem. The difficulty with electric cars is that they can only travel a short distance at a time. At the moment there is no obvious solution to the transport problems of the world's cities.

Текст 10
What Can Be Done About Pollution?

Human beings often react to problems with their emotions rather than with the capacity for logic with which they are endowed. Policies recommended to control pollution reflect this human characteristic. Typical recommendations call for direct control of pollution by the state. But this is only one of the possible avenues of reducing pollution problems. Others include indirect control by the state through a system of incentives encouraging potential polluters not to pollute or to limit their pollution, and an examination of the institutions of private property rights and markets to see if they can be modified to provide the desired limitations on polluting activities.

Direct Controls. An appealing, simple way to control pollution is to have the government ban polluting activities, or agents. If phosphates contaminate water, they ban the use of phosphates in detergents. If DDT pollutes water and land, ban the use of DDT. If burning of fuel oil and coal increases the sulfur oxide content of the atmosphere, prohibit their use. Require industrial plants to clean the pollutants from whatever it is they discharge into the atmosphere or water. The method is straight-forward and, on the face of it, seems eminently fair. Government agencies, notably the Environmental Protection Agency (EPA) at the federal level, use direct controls to reduce many kinds of polluting activities. They set and attempt to enforce emission standards for such polluters as automobiles, power plants, and steel mills. The state regulation of polluters to the extent that it is accomplished is in general supervised by the EPA.

The case of the city with the terrible stench shows that complete prohibition of pollutants is not likely to be worth its costs. Pollution control uses resources that could have produced goods and services, and the value of the goods and services forgone is the opportunity cost to society of controlling the pollution. If the damage done by an additional unit of pollution is less than the costs of preventing it from occurring, community welfare is greater if it is allowed to occur. Consequently, direct controls usually should aim at a less idealistic goal than a pollution-free

environment. They may take the form of controlling the level of pollution by such devices as setting emissions standards or limits for industrial plants, automobiles, and other polluters.

One problem raised by the use of direct controls to limit the amount of pollution is that it presupposes the regulatory body can determine what the economically desirable levels of pollution are. This is not an insurmountable problem. Tolerance limits on the amount of pollution to be allowed can be reasonably well established. Within those limits, overall costs can be weighed continually against benefits to establish an approximation of the desirable levels of pollution. The second problem is the difficulty facing a regulatory body in achieving an efficient allocation of the permissible pollution among different polluters. For example, it may be more costly for a steel mill to eliminate a unit of sulfur oxide from its emissions than it is for a power plant. In the interests of economic efficiency, it is best to eliminate pollution where it is least costly to do so. Thus, the power plant should be required to reduce its sulfur oxide emission before the steel mill is required to do so. This is a difficult kind of decision for a regulatory body to make, since it is responsible to a political body for which economic efficiency is not a primary goal. In addition, it is unrealistic to suppose that regulatory body has a working knowledge of the nature of costs for every polluter. A third problem is that of enforcing the standards of emissions once it has been determined what those standards should be. Direct controls fail to provide polluters with an economic incentive not to pollute. In fact, it will pay them to seek ways and means to evade the pollution standards set for them. But we should not overstate the enforcement problem. Almost any prohibition of activities that individuals and business firms want to engage in creates enforcement problems.

Indirect Controls. It is possible for the government to control many types of pollution by placing taxes on polluting activities. Where the amounts of polluting discharges can be measured for individual polluters, a tax can be placed directly on each unit of discharge. This will induce the polluter to reduce the amount of pollution that is discharged. In some cases where such measurement is not possible, polluters may be taxed indirectly-for example, automobiles not equipped with pollution control devices can be subjected to a tax on a mileage basis. This would induce their owners either to install pollution control devices or to drive less. At this time, not much use has been made of this method of control.

The tax can be set at any desired level, depending on the amount of pollution the government decides to allow. Raising the tax will decrease

the amount of pollution, and lowering the tax will increase it. Ideally, the tax should be set at a level at which the marginal benefits to society of cleaning a unit of discharge equal the marginal cleaning costs. If the level of polluted discharge permitted is such that the marginal benefits of cleaning the discharge exceed the marginal costs of cleaning it, the tax is too low and should be increased. If the level of polluted discharge permitted is such that marginal benefits of cleaning are less than marginal costs of cleaning, the tax is too high and should be decreased.

The use of taxes to control pollution has its advantages. A major one is that it provides an incentive to the polluter to seek improved ways and means of cleaning up its discharge. Another advantage is that it prevents the polluter from shifting some of its production costs (pollution costs) to others; it reduces the incentive to overproduce. There are also disadvantages. First, it is usually difficult to determine the benefits (total and marginal) to society of cleaning the discharge. Second, enforcement of such a tax is not easy. Policing is necessary to determine that the discharge is indeed properly cleaned. Third, taxes are levied by political rather than economic bodies, and politics may well get in the way of the enactment of appropriate tax levels. The federal government has used subsidies – the opposite of taxes – extensively as a pollution control measure. These consist primarily of grants made to state and local governments for the construction of sewage treatment facilities. For the fiscal year 1987, about 62 percent of federal outlays on pollution control and abatement were for construction of this type. This percentage is estimated to decrease somewhat during 1988-89.

Private Property Rights. Since the absence of well-defined property rights provides an important incentive to polluters to dump their wastes in certain segments of the environment, the assignment of property rights either to firms that pollute or to those that benefit from a clean environment may provide a means of control in some cases. Consider, for example, the case described earlier about the upstream paper industry and downstream power industry. Since neither owns the river, the paper industry is able to use it for waste disposal, and the costs of the waste disposal fall on the power industry. Suppose that rights to the river are sold at auction by the government. These rights will be purchased by the industry to which they are most valuable. If annual value to the paper industry of using the river for waste discharges (the costs of alternative means of disposing of the wastes) exceeds the annual cost to the power industry of cleaning the water, the paper industry will buy the rights. The

river will be put to its most valuable use – that of being a sink for waste disposal. However, if the value of clean water to the power industry (the costs of cleaning it for power industry use) exceeds the value to the paper industry of using the river to discharge wastes, the power industry will purchase the rights , and the river will be put to its most productive (valuable) use – that of furnishing clean cooling water for the generation of electricity.

Regardless of which industry buys the rights, changes in the relative values of the two uses will provide incentives for river to be put to the use in which it is most valuable. If the paper industry holds the rights to the river but the annual value of clean water to the power industry exceeds the annual value of the river as a waste disposal, the power industry will be willing to pay the paper industry enough to induce it not to pollute – to use alternative means of disposing of its wastes. On the other hand, if the power industry owns the rights and the annual value of the river to the paper industry as a waste disposal exceeds the annual cost to the power industry of cleaning the water, the power industry will sell the paper industry pollution privileges.

The environment provides environmental services that are used by both household units and producing units of the economy. In the processes of consumption and production, wastes are generated. If the ecological system cannot recycle these wastes as fast as they generated, wastes accumulated. This constitutes pollution. Economic analysis of pollution provides a perspective on its causes and its effects, along with the costs and benefits of controlling it. Incentives to pollute stem from (1) an absence of property rights in the environment and (2) the collectively consumed nature of whatever is being polluted. Polluters, by polluting, transfer a part of their costs to others. Cost-benefit analysis is useful in determining how much pollution should be allowed. It indicates that it is seldom in the common interest to forbid pollution altogether. There are three main avenues that government pollution control policies can take. First, certain polluting activities may be controlled directly through prohibitions or limitations on polluting activities. Second, they may be controlled indirectly by providing polluters with incentives not to pollute – say, through taxation of polluting activities. Third, in some cases pollution can be controlled by selling or assigning individuals property rights to whatever is being polluted, then allowing them to sell pollution rights to would-be polluters.

Текст 11
A Dying Sea

Some of the most heavily polluted rivers in the world flow into the North Sea. The Rhine, for example, daily carries down from Europe's industrial heartland one hundred tons of toxic heavy metals. It is the same story for the other six major rivers which discharge into the southern part of the North Sea: a deadly and never-ending flow of chlorines, acids and toxic metals.

Surprisingly, the River Thames now has a clean bill of health-an example of what can be achieved when the political will is there. It now has the cleanest metropolitan estuary in the world and salmon can be found swimming in it. However, one hundred miles to the north the Humber spews out a familiar brew of poisonous chemical compounds.

Occasional events bring the desperate plight of the North Sea to our attention. Most recently there has been unprecedented growth in the quantity of marine algae using up vast amounts of the water's dissolved oxygen content, first killing fish and then the birds and seals which feed on them. The red tides of phytoplankton are created by another type of poison which is flowing into the North Sea at ever-increasing rates: the nitrates and phosphates which are used as fertilisers in intensive farming techniques and which are, sooner or later, washed off the agricultural land into the rivers. The North Sea suffers from airborne pollution, too; most of it carried eastward from Britain's coal and oil-fired power stations. The five million tons of sulfur and nitrogen oxides which belch from Britain's high chimneys each year fall either as acid rain over the Scandinavians (whose complaints are largely ignored) or fall into the North Sea. Britain refuses to go along with European attempts to limit such airborne pollutants. Other poisons are deliberately discharged into the skies above the North Sea by the three incinerator ships which are permanently moored 100 miles off the coast of Britain. There are many signs that the southern half of the North Sea, including the Wadden Sea, German Bight and the Utland cost, is dying. Up to fifty per cent of certain types of fish caught in these waters are found to be diseased. A colony of seals living off the Dutch coast has shrunk from numbering 3000 to only 600 in a period of fifty years. In the space of one month during 1983, 30.000 sea birds were washed up on Scotland's eastern beaches; they had starved to death.

From time to time the North Sea has been a fertile source of fish for the fishing fleets of Europe and it still supports a population of some ten million

sea birds. But its other and more recent role as rubbish tip for the industrial waste of Europe, is threatening to put up an end to this. In the opinion of many, Britain deserves a large portion of the blame. "Britain now stands isolated in vehemently defending its rights to use coastal waters as a dumping ground for industrial waste", says Greenpeace. Only time will tell whether public concern aroused by speeches from the Queen and the Prince of Wales can force a change in policy and thereby reduce the threat posed by the impending death of the North Sea.

Текст 12
Facing up to the Problem

A single disposal company, Intercontract SA of Fribourg, Switzerland, plans to dump 50,000 tons of chemical waste per year for ten years in the tiny West African state of Guinea-Bissau, which is no bigger than Wales. The French have been sending their toxic waste to Morocco for years. Toxic waste disposal is now big, international business in which a number of poor African nations have become embroiled. They charge less; it can cost as much as &280 per ton to dispose of toxic waste in Europe; in Africa it can cost less than two pounds. Even so, dumping payments can easily add up to two or even three times the national product of the countries concerned. The potential for bribery is immense. A London-based African diplomat claims to have been offered three million pounds as persuasion not to obstruct the settlement of a dumping contract. In 1988 a Norwegian consul was arrested in Guinea for forging documents required for dumping.

According to the United Nations Environment Programme, dumping in Africa has increased as stricter anti-dumping laws are passed in industrialised countries and as other dump sites in the South Pacific and the Caribbean become filled. The only light in the end of the tunnel is that certain African countries have now made the dumping of some highly toxic substances illegal.

Britain is the first European country to have faced up to the problem of where to put its radioactive waste. This is not just because Britain creates a large quantity of waste but because it has undertaken to process and dispose of the spent nuclear fuel from atomic power stations of its European neighbours. This radioactive waste disposal business is worth about 4 hundred million pounds each year to the British economy. The irony is that the British still haven't decided how to make radioactive waste

safe. So they have a temporary pile of nuclear rubbish which could fill the Palace of Westminster several times over. The most immediate problem concerns low and intermediate level waste products. The more highly radioactive waste cannot be permanently disposed of for at least fifty years anyway; it has first to cool down.

There are two schools of thought on the problem of radioactive waste disposal; the first thinks the waste should be put somewhere, anywhere as far away as possible from population centres -perhaps in geologically fast tunnels miles beneath the surface of the earth or the seabed. The second (and these include the environmental lobby group Greenpeace) thinks the waste should be put somewhere where it can be monitored for leakage and where leaks, once established, are capable of being securely sealed. This seems by far the more responsible attitude, but the waste would have to be monitored for a hundred years or more and future generations may be less responsible than our own. In any case, do we have the right to impose this burden on them?

HM Elizabeth 2 addressed King Olaf of Norway at a banquet in his honour at Windsor Castle 12th April 1988,"Seafaring is in the blood of both our peoples and the North Sea, which might appear to others as a barrier, has been a means of trade and communications and has provided natural resources for both our people for more than one thousand years. In more recent times we have co-operated to exploit its valuable oil and gas resources. It is therefore in the interests of both our nations to see that the health and cleanliness of the North Sea are maintained and that its renewable resources are only exploited on a sustainable basis.

Текст 13
Economics of Social Issues

What is pollution? We will not make much progress in an economic analysis of pollution until we are familiar with both the nature of the environment in which we live and what it is that constitutes pollution of that environment. We shall consider these two concepts in turn.

The environment and its services. The environment is easily defined. It consists of air, water and land around us. These provide us with a variety of important services, including a habitat in which to live and resources with which to produce goods and services. The services of the environment are used by production units and household units as they engage in activities of various kinds. Production units lay heavy claims on the

environment's resources, but they may also make use of its habitat and amenity characteristics. As production units engage in the process of transforming raw and semi-finished materials into goods and services that will satisfy human wants, there are at least three ways in which the environment can be affected. First, some of the environment's stocks of exhaustible resources may be diminished. These include coal, petroleum, and many other mineral deposits. Second, it is called upon for replaceable resources like timber, grassland, oxygen, and nitrogen. Third, it is used as a place to dispose of the wastes of the production and consumption processes- as a gigantic garbage disposal.

Recycling of wastes and the concept of pollution. The pollution problem arises primarily from the use of the environment by producers and consumers as a dumping ground for wastes. We litter the countryside with cans, paper, and the other residues of consumption and production. We dump the emissions from our automobiles and factories into the atmosphere. We empty sewage and residue from production directly and indirectly into streams, rivers, and lakes. As wastes from production and consumption are dumped into the environment, nature sets recycling processes in motion. Animals use oxygen, giving off carbon dioxide wastes, but plants use carbon dioxide, giving off oxygen wastes. Dead plant and animal life are attacked by chemical elements that decompose them, restoring to the soil elements that the living organisms had withdrawn from it. Living organisms frequently contribute to the decomposition process. Iron and steel objects rust and disintegrate over time. So do wood and other matter. Wastes that can be decomposed in air, water, and soil are said to be biodegradable. But there are some wastes that are not biodegradable. Aluminum containers such as beer cans are a case in point. Recycling- the transformation of wastes into raw materials that are again usable- requires variable lengths of time, depending on what it is, that is being recycled. It takes many years for a steel pipe to rust away. Wood varies a great deal in the time it takes for its complete disintegration. But many plant and animal products require only a very short time to decompose. Pollution consists of loading the environment with wastes that are not completely recycled, are not recycled fast enough, or are not recycled at all. It involves a diminution of the capacity of the environment to yield environmental services. Pollution occurs when recycling processes fail to prevent wastes from accumulating in the environment.

Economics of pollution. No one likes pollution. Almost everyone would like to see something done about it. Toward this end, we consider in

this section the fundamental economics of the pollution problem. We shall examine the reasons of pollution occurs, analyze the effects of pollution on resource allocation, look at the costs of pollution control, and identify its benefits. We shall attempt to establish criteria for determining the appropriate level of control.

Текст 14
Hydroponics: Farming without Dirt

Hydroponics, an unconventional growing technique, is the cultivation of plants in water. Revolutionary as it may sound, plants do not need soil as such: they need only the nutrients and moisture contained in the soil, and these can be supplied through gravel that contains water, as well as through soil.

Hydroponics is not a new process. As long ago as in 1690, an English physician tried to grow plants in water in a laboratory experiment, and in 1800s German researchers used the method to develop many of the formulas for plant nutrient solutions still in use today. About a generation ago, hydroponics moved out of the research laboratory into commercial use. A Californian physiologist, W.F.Gericke, published guidelines for hydroponic agriculture in 1936. Use was made of hydroponics in some military operations during World War 2. In the past 40 years, research projects and commercial ventures in hydroponics have gone forward in a number of countries, including areas where water is in short supply and temperatures are too extreme for ordinary agriculture.

One of the leading companies in the field of hydroponics is Hydroculture Incorporated of Glendale, Arizona, which operates about 200 greenhouses on a 48-hectare section of land. Hydroculture produces more than 2.7 million kilograms of vegetables and fruit each year – mostly tomatoes, but also cucumbers, lettuce, and melons. Crop yields are excellent, according to officials of Hydroculture. Foe example, each tomato plant produces an average of 12.1 kilos of fruit in a year of two growing cycles. This compares with about 9 kilos for two crops of the average soil-grown plant.

Hydroculture's greenhouses measure 8 by 39 meters and consist of steel frames covered with reinforced plastic film that is resistant to weather and lets in a maximum amount of light. The plants are fed by inorganic nutrients dissolved in water which is supplied by a plastic pipeline. The feeding and watering system is automated. Electric sensing devices

(sensors) determine when the plants are hungry or thirsty. The sensors send impulse messages that automatically activate the water and nutrient delivery system. When the sensors "know" that the plants have had enough, the system shuts off automatically. Nothing is left to chance within the greenhouses. Temperature, humidity, air circulation are carefully controlled. Air conditioning and heating equipment keep the temperature at 29 degrees Celcius by day and 18 degrees by night. No entry is given to wind, hail, frost, drought, weeds, or insects.

Hydroculture also produces a unit that is designed to produce grasses fro feeding livestock. Measuring 2.4 by 3.5 meters, the unit can produce enough grass to satisfy the daily feed requirements of 70 horses. A half kilo of seed (usually oats or barley) normally produces three to four kilos of grass, 20 to 25 cm. high.

In recent years hydroponic farming has been expanding in many parts of the world. Research and application of the method has occurred in Italy, foe example, where one of the largest hydroponic installations in Europe – 50,000 square meters of greenhouses in Sicily – produces tomatoes, cucumbers and other vegetables. A hydroponic farm operated by the government of Kuweit produces fresh tomatoes at a desert site near the capital city. At Puerto Penasco, Mexico, and on Sadiyat Island in Abu Dhabi, experimental hydroponic farms use seawater that is desalted by special installations located on the cost. Despite these multiple examples of development, soil-less agriculture still remains only a minor competitor to the traditional open-field way of growing crops. Hydroponics accounts for only a small fraction of world output of food and fiber, and its potential is primarily in arid-region agriculture, or in the production of high-priced specialty crops which reward costly investments and intensive care.

Текст 15
Energy From The Sun

Our period of history is sometimes called the atomic age, but scientists and engineers continue to investigate other new sources of energy. During the past few years, there has been much interest in the possibility of converting the energy of the sun into useful power. Radiation, the fuel for solar energy, is the radiation which the sun transmits to the earth through some 92,500,000 miles of virtually empty space. The distribution of radiation intensity throughout the solar spectrum tells us that the sun's surface temperature is about 10,000 °F. The temperature of the

sun's interior is estimated to be 30,000,000^F. Solar energy is measured in terms of the heat produces when the radiation falling on a surface is completely absorbed. The rate at which solar energy reaches the earth's atmosphere is known as the solar constant.

The radiant energy which reaches the outer fringes of our atmosphere is materially reduced by scattering and absorption before it reaches the earth's surface. On a clear day, at sea level, the direct radiation may range from 250 to 320 Bt/ft2hr. From 30 to 40 percent of radiation, which is scattered by dust and absorbed by air molecules, water vapour, is not entirely lost, because about half of it reaches the earth as diffused radiation. The total usable solar energy is the sum of these two components. A concentrating collector, such as a solar furnace, can use only the direct radiation which travels in straight lines and can be focused. A flat plate collector can use both the direct and the diffused radiation. The total amount of radiation which reaches a collector on the earth's surface depends upon the number of hours of sunshine per day, and the thickness and nature of the atmospheric path through which the sun's rays must travel.

Most of the inhabited areas of the world receive plenty of solar energy to meet all man's requirements. The problem which the engineer must solve is how to use this abundant supply of free income energy at a total cost which is within our ability to pay. The large-scale industrial use of the sun's power will become a reality when the first solar power station comes into use on the sunny Ararat Plain in Armenia. It will be the first solar power station in the world with a capacity of 1,200 kw. The station is supposed to generate annually 2,5 million kw of electric power and 20,000 tons of steam. The Ararat Plain has been chosen for the first station because of its being one of the places with the greatest amount of sunshine: it is recorded to get 2,600 hours of sunshine a year. Each square yard of surface gets well over 2,250 million calories of heat a year.

We expect the solar station to look very different to the usual power plant – no smoky chimneys, no giant dams. The unit will consist of an enormous circle with tree around it to cut down the amount of dust. In the centre there will be a 130-foot tower with a high pressure boiler installed at the top of it. Around the tower 23 concentric circular railway tracks are being built. Along them, trains automatically following the movement of the sun will pull 1293 large mirrors mounted on special cars. The mirrors will always be directed towards the sun by means of automatic relays, thus reflecting the beams on the flat surface of the boiler. Other automatic

devices synchronized with the trains will adjust the angle of the boiler so that all these beams reflected from the mirrors fall on it perpendicular. The sun's rays will heat the water in the boiler from which steam at a pressure of 30-35 atmospheres will be piped off to the 1,200 kw steam turbine the same way as ordinary boilers operating with ordinary fuel.

The station will be able to operate only when the sun shines. The sun's rays falling upon photo-electric cells, the whole apparatus will automatically go into operation. The power from the station will be used for operating irrigation pumps on the local farms, and the waste steam from the turbines can be used for providing ice. Hot water from the station stored in underground reservoirs will serve the purpose of heating hot-houses and private homes.

Текст 16
Adaptations To Cold

All living organisms abhor cold. For many susceptible forms of life a temperature difference of a few degrees means the difference between life and death. Everyone knows how critical the temperature for the growth of plants is. Insects and fishes are similarly sensitive; a drop of two degrees in temperature when the sun goes behind a cloud, for instance, can convert a fly from a swift flier to a slow walker. In view of the general hostility of cold to life and activity, the ability of mammals and birds to survive and flourish in all climates is altogether remarkable. It is not that these animals are basically more tolerant to cold. We know from our own reactions how sensitive the human body is to chilling. A naked, inactive human being soon becomes miserable in air colder than 28 degrees Centigrade or about 82 degrees Fahrenheit, only 10 degrees C below his body temperature. Even in the Tropics the coolness of night can make a person uncomfortable. The discomfort of cold is one of the most vivid of experiences. Cold weather or cold living quarters compounds the misery of illness or poverty. Over the entire planet, a large proportion of man's efforts, culture and economy is devoted to the simple necessity of protection against cold.

Yet strangely enough neither man nor other mammals have consistently avoided cold climates. Indeed, the venturesome human species often goes out of its way to seek a cold environment, for sport or for the adventure of living in a challenging situation. One of the marvels of man's history is the endurance and stability of the human settlements that have

been established in arctic latitudes. Archaeologists today are finding many sites and relics of earlier ancestors of the Eskimos who occupied arctic North America as long as 6,000 years ago. It is therefore a matter of more than idle interest to look closely into how mammals adapt to cold. In all climates and everywhere on the earth mammals maintain a body temperature of about 38 degrees C. To keep their internal temperature at a viable level the mammals must be capable of adjusting to a wide range of environmental temperatures. In tropical air at 30 degrees C (86 degrees F), for example, the environment is only eight degrees cooler than the body temperature; in arctic air at -50 degrees C it is 88 degrees colder. A man or a mammal in the Arctic must adjust to both extremes as seasons change. The mechanisms available for making the adjustments are (1) the generation of body heat by the metabolic burning of food as fuel and (2) the use of insulation and other devices to retain body heat. We need not dwell on the metabolic requirement; it is rarely a major factor. Moreover, even if metabolic capacity and the food supply were unlimited, no animal could spend all its time eating. Like man, nearly all other mammals spend a great deal of time in curious exploration of their surroundings, in play and in family and social activities. There is a common impression that life in the cold climates is more active than in the Tropics, but the fact is that for the natural populations of mammals, including man, life goes on at the same leisurely peace in the Arctic as it does in warmer regions; in all climates there is the same requirement of rest and social activities.

The decisive difference in resisting cold, then lies in the mechanisms for conserving body heat. The investigations have covered a wide variety of mammals and birds and have yielded conclusions of general physiological interest. The studies began with an examination of body insulation. The fur of arctic animals is considerably thicker, of course, than that of tropical animals. Actual measurements showed that its insulating power is many times greater. An arctic fox clothed in its winter fur can rest comfortably at a temperature of-50 degrees C without increasing its resting rate of metabolism. On the other hand, a tropical animal of the same size (a coati, related to the raccoon) must increase its metabolic effort when the temperature drops to 20 degrees C. Naked man is less well protected by natural insulation than the coati; if unclothed, he begins shivering and raising his metabolic rate when the air temperature falls to 28 degrees C.

Obviously as animal decrease in size they become less able to carry a thick fur. The arctic hare is about the smallest mammal with enough fur to enable it to endure continual exposure to winter cold. The smaller animals

take shelter under the snow in winter. Weasels, for example, spend the winter in nests and sheltered runways under the snow and rarely come to the surface. No animal, large or small, can cover all of its body with insulating fur. Organs such as the feet, legs and nose must be left unencumbered if they are to be functional. Yet if these extremities allowed the escape of body heat, neither mammals nor birds could survive in cold climates. A gull or duck swimming in icy water would lose heat through its webbed feet faster than the bird could generate it. Warm feet standing on snow or ice would melt it and soon be frozen solidly to the place where they stood. For the unprotected extremities, therefore, nature has evolved a simple but effective mechanism to reduce the loss of heat: the warm outgoing blood in the arteries heats the cool blood returning in the veins from the extremities. This exchange occurs in the network of small arteries and veins near the junction between the trunk of the animal and the extremity. Hence the extremities can become much colder than the body without either draining off body heat or losing their ability to function. This mechanism serves a dual purpose. When necessary, the thickly furred animal can use their bare extremities to release excess heat from the body. A heavily insulated animal would soon be overheated by running or other active exercise were it not for these outlets. The generation of heat by exercise turns on the flow of blood to the extremities so that they radiate heat.

Even more striking examples of this kind of mechanism are to be found in whales, walruses and hare seals that dwell in the icy arctic seas. The whale and the walrus are completely bare; the hare seal is covered only with thin, short hair that provides almost no insulation when it is sleeked down in the water. Yet these animals remain comfortable in water around the freezing point although water, with a much greater heat capacity than air, can extract a great deal more heat from a warm body. How are the chilled tissues of all these animals able to function normally at temperatures close to freezing? There is first of all the puzzle of the response of fatty tissue. Animal fat usually becomes hard and brittle when it is cooled to low temperatures. This is true even of the land mammals of the Arctic, as far as their internal fats are concerned. If it were also true of extremities such as their feet, however, in cold weather their feet would become too inflexible to be useful. Actually it turns out that the fats in these organs behave differently from those in the warm internal tissues. Farmers have known for a long time that neat'-foot oil, extracted from the feet of cattle, can be used to keep leather boots and harness flexible in cold weather. Eskimos have long been aware that fat from a caribou's foot will serve as a fluid lubricant in the cold, whereas the marrow fat from the upper leg is a solid food even at room temperature.

Nature offers many illustrations of the slowing of tissue functions by cold. Fishes, frogs, and water insects are noticeably slowed down by cool water. Cooling by 10 degrees C immobilize most insects. A grasshopper in the warm noonday sun can be caught only by a swift bird, but in the chill of early morning it is so sluggish that anyone can seize it. We know from our own sensations that our fingers and hands are numbed by cold. Here lies an inviting challenge for all biologists. By what devices is an animal able to preserve nervous sensitivity in tissues cooled to low temperatures? Beyond this is a more universal and more interesting question: How do the warm-blooded animals preserve their overall stability in the varying environment to which they are exposed? I predict that further studies of the mechanisms involved in adaptation to cold will yield exciting new insights into the processes that sustain the integrity of warm-blooded animals.

Текст 17
The Project GHOST

A balloon launched from New Zealand, disappeared in the Indian Ocean after 234 days of flight. Floating with prevailing winds at a constant height of 12 km, it had circumnavigated the Earth 20 times. During said time it had constantly supplies meteorological information about the upper atmosphere. The balloon was one of the 88 released over a period of a year as part of the evaluation programme for Project GHOST (Global Horizontal Sounding Technique). This project is one of a number now being evaluated as a means of providing world-wide coverage of meteorological conditions during the next decade. The experiences were so successful that GHOST now appears to be the most promising project. The eventual aim would be to keep some 6,000 balloons circling the Earth at altitudes between 5 and 25 km. The information they provide would be relayed to satellites and then to a ground based computer for analysis.

The heart of the GHOST is the super-pressure spherical balloon. Basically, there are three types of balloon now in use. The most familiar, and the one in daily use throughout the world, is the expandable, unvented balloon. Made like a child's toy balloon of rubber or synthetic rubber, it is designed to ascend until the expanding gas stretches the balloon wall to the breaking point. Balloons of this type are used to carry aloft the many hundreds of radiosondes launched each day by the various national services to take measurements in the upper atmosphere. The other two balloon types are non-extensible, made of one of the plastic films. The

more common type is used for carrying scientific packages ranging from film packs, used to investigate cosmos radiation, to heavy and complex astronomical equipment. This type has been used for almost all manned flights and is known as a zero pressure balloon because it permits the expanding gas to escape once the balloon envelope has been filled to its full volume. This results in the internal gas pressure equaling that of the outside atmosphere. With the valving off this 'free lift' gas, neutral buoyancy is quickly achieved and the balloon floats at a relatively constant altitude. This condition continues until changes in the radiation environment allow the gas to cool, thereby contracting and decreasing the volume occupied by the balloon system. Having less volume, the balloon begins to descend unless part of the balloon total weight, in the form of ballast, is expended.

The super-pressure balloon, on the other hand, does not vent the predetermined amount of excess gas once it has filled out to its full volume. It rises until the mass of the displaced air equals the mass of the balloon and its instrument package, and the gas, sealed within the balloon, unable to expand, exerts an increasing pressure on the walls of the balloon. The internal pressure becomes considerably greater than the atmospheric pressure; hence the term 'super-pressure'. As the radiation environment changes, the heating or cooling of the lifting gas increases or reduces the overpressure. The volume and mass of the balloon remain essentially constant so that it continues to float at a constant density altitude. The only change the balloon experiences is the change in skin stress. Some change in the size of the balloon does occur with these skin stress changes. With the polyester film used in constructing the balloons now circling the Southern Hemisphere, a one per cent increase in the internal balloon temperature over that of the outside air will cause the balloon to increase in volume by 0.15%. This results in a change in altitude of about 10m. Since the most drastic change in internal temperature occurs at sunset and again at sunrise, this being a 3 or 4 per cent temperature change, the balloon will vary in its altitude by a maximum of 30 to 40m.

The theoretical life of these balloons is determined by the rate at which the lifting gas diffuses through the balloon walls. The percentage gas loss per day is proportional to the pressure and to a diffusion, or permeability, factor and inversely proportional to the balloon radius and the thickness of its walls. The diffusion constant is dependent on the type of film used, the gas employed and the gas temperature. A balloon which loses 0.01 per cent of its gas per day and has an initial night-time

overpressure of 10% should fly for 1,000 days. A computer programme is now being designed that will mathematically compute not only the exact balloon position but the velocity as well, direct from the raw code letter period data. Since the balloon moves with the air mass in which it is suspended, we will then be able to define exactly the wind structures and study the air circulations more thoroughly. Today, the vast majority of data above the surface are obtained by radiosondes – instruments which are carried aloft more or less vertically and which sense temperature, pressure and moisture, and telemeter these data to the ground. These probes are tracked by radar or direction finders, yielding wind data, to altitudes of 30km before the balloons burst. Based on the number of sites from which these flights are made and the areas delineated by them, adequate data are available over only 20% of the Northern Hemisphere and less than 10% of the Southern Hemisphere.

The GHOST will help alleviate this situation. With improved fabrication and testing techniques, there appears to be no problem in obtaining reliable flight for periods in excess of two years at 200mb. The flight test programme for 30mb (24km) balloons is just beginning. The theoretical life of 80 years for these balloons is balanced against both the difficulty of testing these larger balloons to ensure that they have no leaks and the probability that the seals and film will deteriorate in the presence of the more intense ultraviolet light at the 24km altitude. The results of the initial GHOST flight tests have dramatically shown the promise of the technique – and highlighted the problems requiring additional investigation.

Текст 18
The Youngest Stars

Until less than a quarter-century ago the stars appeared to astronomers as bewildering collection of species among which it was difficult to find any systematic interrelations. Today, although some of the phenomena remain mysterious and new species are turning up, the apparent chaos in the sky is being resolved into order. The basic concept for understanding the nature and history of stars grew from the discovery (barely30yearsago) of how they generate their energy. They do so by thermonuclear process that ‘burns’ hydrogen and converts it into helium. On the basis of the known energy output of our sun, that means that the sun must be burning hydrogen at the rate of 700 million tons per second for

about 10 billion years. The most massive stars (50 to 100 times greater in mass than the sun) have luminosities that indicate they are burning their hydrogen a million times faster than the sun.

Accustomed as we are to thinking of the stars as permanent fixtures, it is surprising to realize that the brightest present stars – such as Rigel in Orion – cannot have been shining as such when the first men walked the earth. In short, the formation of new stars must be going now – and not so far form us. Star formation must be going on today at all stellar masses, great and small, because of the observed fact that bright stars are usually found together with a large number of less massive but physically related objects formed at about the same time, and always in a region filled with interstellar dust. Whence come the raw material that is continuously forming such massive stars or, for that matter, that produces a system such as the Pleiades, a cluster of some 300 stars with a total mass amounting to 500 times that of the sun? The only known sources that could furnish such huge quantities of matter are the diffuse clouds of dust and gas that lie along the spiral arms of the galaxy.

The question of the formation of new stars brings us to the particulars of our story. In the 1940s, Alfred H. Joy began a systematic study of certain variable stars that exhibited rather peculiar properties. Joy named them the T-Tauri stars, after an example of this type that had been known for nearly a century. One of their peculiarities was that in spectroscopic examination they showed a spectrum dominated by very intense emission lines. These stars must be very young. All of them lie in the midst of patches of interstellar dust; they show a striking preference for dust-filled regions in the galaxy, which are the only places where the raw material for the star formation is available in quantity. The T-Tauri stars are found in precisely those regions, and only in those regions. Another strong piece of evidence is the fact that they are generally clustered with high-luminosity, short-lived stars whose extreme youth is beyond question on the basis of energy generation arguments. Moreover, the number of T-Tauri stars in the neighbourhood of our sun is found to be roughly in agreement with the expected birthrate of new stars, on the assumption that the stellar population is to be maintained at approximately a constant level.

The observed size and the surface brightness of the T-Tauri stars give physical evidence of their youth, according to the present theoretical concepts of the process of star formation and development. To see why, let us briefly discuss the later stages of the formation process as current theory views it. Consider a cloud of gas and dust, having about the mass of our

sun that is condensing into a star. When the object has for rather a long time shrunk to about the diameter of our solar system, it is still a comparatively cool, dark cloud. But at that point, as gravitational attraction shrinks it further, a new phenomenon appears: some of the released by the contraction begins to go not into heating the gas but into internal work such as breaking up hydrogen molecules and ionizing atoms. This diversion of energy results in a reduction of the internal gas pressure below the point required to support the outer layers of the cloud. Consequently, the cloud quickly collapses. It shrinks from the size of the solar system to a ball with a radius about equal to the distance from the sun to the Mercury orbit – that is, the size about 100 times the size of our present sun. In short, the effect is that a new born star suddenly appears in the sky.

The T-Tauri stars are all rapidly ejecting material into space. The expelled material is flowing out of the star at velocities of as much as 200 or 300 kilometers per second. There is no evidence that the material ever returns to the star. If it is completely ejected, these stars must lose a substantial proportion of their mass. What physical processes or attributes can account for the distinctive features of the T-Tauri stars: their extremely active and luminous chromospheres, their massive ejection of surface material, their variability in brightness? None of these phenomena are predicted by the modern theory of the contraction of young stars. Each still is a complete mystery. The sun is a middle-aged star that presumable passed through the T-Tauri phase about five billion years ago (some n\million of years after the sun came into luminous existence). Does it still show a few feeble memories of its more active youth? Apparently it does: the activity of the solar surface suggests a faint echo of the enormous surface activity that characterizes the T-Tauri stars, and the solar wind may be a trace remnant (reduced more than millionfold) of the immense ejections of matter in its T-Tauri youth.

Текст 19
Allotropes

It is interesting chemical phenomenon that certain elements can exist in more than one stable form. A chemical element is said to exhibit allotropy when it occurs in two or more forms and such forms are called allotropes. Allotropes generally differ in structure and in both physical and chemical properties. The familiar elements that exhibit allotropy are carbon, oxygen, sulfur, phosphorus, and tin. Here we briefly describe the allotropes of carbon and oxygen.

Carbon. There are two allotropes of carbon – graphite and diamond. Looking at them, you may find it hard to believe that both substances are made of the same carbon atoms. Yet, their different physical appearance and properties are determined only by the manner in which the carbon atoms are linked together. Graphite is a soft, dark black solid with a metallic luster. It is a good conductor of electricity and is used as an electrode (electrical connection) in batteries. The so-called lead in ordinary pencils is in reality a mixture of a graphite and clay. Graphite is also used in stove polish, in typewriter ribbons, and as a lubricant. Diamond is formed over long periods on the geologic scale when graphite is subjected to tremendous pressure underground. In pure form, diamond is a transparent solid. Diamond is less stable of the two allotropes, and in time it will turn back into graphite. Fortunately for diamond jewelry owners, this process takes millions of years. The hardest natural substance known, diamond is used in industry as an abrasive and to cut concrete and other hard substances.

Oxygen. Molecular oxygen is a diatomic molecule, whereas ozone, the less stable allotrope of oxygen, is triatomic one. Molecular oxygen is a colorless and odorless gas; it is essential for our survival. Metabolism, the process by which energy stored in the food we eat is extracted for growth and function, cannot take place without oxygen. Air is about 20 per cent oxygen gas by volume. Oxygen is used in steelmaking and also in medicine. Ozone can be prepared from molecular oxygen by subjecting the latter to an electrical discharge. In fact, the pungent odor of ozone is often noticeable near a subway train where there are frequently electrical discharges. Ozone is a toxic, light blue gas. It is used mainly to purify drinking water, to deodorize air and sewage gases, and to bleach waxes, oils, and textiles. Although ozone is present in the atmosphere only in trace amounts, it plays a central role in two processes that affects our lives. Near the surface of Earth, ozone promotes the formation of smog, which is detrimental to all living things. Ozone is also present in the stratosphere, a region about 40 km or 25 miles above the surface of Earth. There, the ozone molecules absorb much of the harmful high-energy radiation from the sun and thus protect the life beneath.

Текст 20
Coal and Carbon Dioxide

The very existence of our technological society depends on an abundant supply of energy. Although the United States has only 5 per cent

of the world's population, we consume about 20% of the world's energy! At present, the two major sources of energy are fossil fuels and nuclear fission. Coal, oil (which is also known as petroleum), and natural gas (mostly methane) are collectively called fossil fuels because they are the end result of the decomposition of plants and animals over tens or hundreds of millions of years. Oil and natural gas are cleaner-burning and more efficient fuels than coal, so they are preferred for most purposes. However, supplies of oil and natural gas are being depleted at an alarming rate, and research is under way to devise of making coal a more versatile source of energy.

Coal consists of many high molar mass carbon compounds that also contain oxygen, hydrogen, and, to a lesser extent, nitrogen and sulfur. Coal constitutes about 90% of the world's fossil fuel reserves. For centuries coal has been used as a fuel both in homes and in industry. However, underground coal mining is expensive and dangerous, and strip mining (that is, mining in an open pit after removal of the earth and rock covering coal) is tremendously harmful to the environment. Another problem, this one associated with the burning coal, is the formation of sulfur dioxide from the sulfur-containing compounds. This process leads to the formation of "acid rain'.

One of the most promising methods for making coal a more efficient and cleaner fuel involves the conversion of coal to a gaseous form, called syngas for "synthetic gas". This process is called coal gasification. The main component of syngas is methane. In addition, the reactions yield hydrogen and carbon monoxide gases and other useful by-products. Under suitable conditions, carbon monoxide and hydrogen combine to form methanol. Methanol has many uses – as a solvent, a starting material for plastics, and so on. Syngas is easier than coal to store and transport in pipelines. What's more, it is not a major source of air pollution because sulfur is removed in the process.

Although carbon dioxide is only a trace gas in Earth's atmosphere, with a concentration of about 0.03 per cent by volume, it plays a critical role in controlling our climate. The solar radiant energy received by Earth is distributed over a band of wavelengths. Energy from the sun is emitted primarily at wavelengths shorter than 4000 nm, with much of the energy concentrated in the visible region of the spectrum. By contrast, the thermal radiation emitted by earth's surface is confined to wavelengths longer than 4000 nm because of the much lower average temperature of 280 K. Both water vapor and carbon dioxide in the atmosphere can absorb much of the

outgoing radiation and, therefore, affect the overall thermal balance of Earth with its surroundings.

The concentration of water vapor is highest near Earth's surface, but it decreases rapidly with altitude because of the decreasing temperature. Because water molecules absorb infrared radiation very strongly, the presence of water vapor affects the atmospheric temperature at night, when Earth is emitting radiation into space and is not receiving energy from the sun. The term "radiational cooling" is often used to account for the cold morning that follows a cloudless night. Whereas the total amount of water vapor in our atmosphere has not altered noticeably over the years, the concentration of carbon dioxide has been steadily rising since the turn of the century as a result of the burning of fossil fuels. Carbon dioxide's influence on Earth's temperature is often called the greenhouse effect. The glass roof of a greenhouse transmits visible sunlight and absorbs some of the outgoing infrared radiation, thereby trapping the heat. Carbon dioxide acts somewhat like a glass roof, except that the temperature rise in the greenhouse is due to mainly to the restricted air circulation inside.

While carbon dioxide is the main culprit in warming Earth's atmosphere, other "greenhouse" gases such as methane (from natural gas, sewage treatment, and cattle as they digest), chlorofluorocarbons and nitrogen oxides (form car exhausts) also contribute to the heating of Earth. Although the temperature increase of 3-5 °C may seem insignificant, it is actually large enough to affect the delicate thermal balance on earth and could cause glaciers and icecaps to melt. This, in turn, would raise the sea level, resulting in flooding of coastal areas. Current measurements show that earth's temperature is indeed rising, and much more work is needed to understand how the greenhouse effect will affect Earth's climate. It is clear that the greenhouse effect, like acid rain and the depletion of ozone in the stratosphere, is one of the most pressing environmental issues facing the world today.

Раздел V. ГАЗЕТНО-ИНФОРМАЦИОННЫЕ И РЕКЛАМНЫЕ МАТЕРИАЛЫ

Текст 1
The Quarterly Market Report Service

The Quarterly Reports are designed to provide clients with a regular assessment of the supply-demand-price outlook for 18 months forward. The British Sulphur Consultants' team of market analysts incorporates into the reports a detailed analysis of current events and fully developed forecasts, with comprehensive statistical backing. The British Sulphur Consultants' 12th authoritative annual review of the medium-term outlook analyses for sulphur production, consumption, trade and prices, providing a base line for business planning and decision-making.

The Five Year Outlook for Sulphur to 2002

– examines all forms of sulphur production-brimstone, pyrites, smelter acid and other forms – on a regional basis, and assesses demand by end use, by raw material and by region;

– presents detailed "likely case" forecasts in an extensive statistical review, and describes the underlying assumptions in a comprehensive but concise text, highlighting major uncertainties on the supply and demand side.

The Five Year Outlook for Urea to 2002 is available now!

– A comprehensive report for decision-makers and business planners.

– Evaluates the origins of the collapse in urea prices in 1997 and analyses whether and when a new market up-turn can be expected.

– Estimates the impact in terms of potential plant closures and project cancellations.

– Forecasts the outlook for nitrogen & urea demand, urea capacity, urea supply/demand balances, trade, production costs and market prices.

– Provides a statistical database of plant capacities, and country-by-country production, consumption, imports and exports.

The Five Year Outlook for Phosphate Rock to 2002 is available now!

This most recent edition of British Sulphur Consultants' comprehensive annual review offers decision-makers and business planners' key information about the phosphate rock market. The outlook report:

– Presents an up–to date assessment of the supply/demand outlook, international trade forecasts, and pricing trends.

– Examines the implications of the tight supply/demand balance on both producers and consumers of phosphate rock.

– Provides an informed medium term outlook for capacity closures, capacity expansions, and new project development.

– Includes an extensive, updated database on reserves, production, consumption and trade.

Текст 2
WE BUY COMPLETE PLANTS AND PROCESSING LINES PROVEN RECORD GLOBAL REACH THE RIGHT RESOURCES

Eliminate the significant cost of idled facility maintenance or demolition. UPE will purchase your plant, processing line or equipment for cash and provide dismantling services if necessary.

Over the past twenty years we have been turning unused assets into capital. As the leader in creating manufacturing solutions for the process industry we know what it takes to get plants out of one production stream and into another. We've been doing just that for some of the largest corporations in the world.

UPE, as a part of the Universal Group, can bring to bear all of its global resources. Through our network of facilities in the United States, United Kingdom, Germany, Poland, China, Mexico and Czech Republic we can complete a purchase quickly and economically.

Your company can benefit from all our financial, technical and production resources. The purchase of an entire plant often requires knowledge of the industry, the right contacts, and the optional inventory in place to fulfill most buyers' requirements. Universal Process Equipment has what it takes. We have thousands of customers spanning the process industry, contacts in every level of management, we maintain a large inventory of plants and 30,000 pieces of equipment to fill any production holes for a prospective plant buyer. In addition, we can buy the real estate, dismantle and remove the plant, re-erect it and help counsel our customers along the way.

If you have a plant or a processing line to sell, or need one yourself, contact us. UPE can help.

Текст 3
Civic Legal Aid (Biennial report fiscal year 2007-09)

Throughout Washington state people are hurting. Jobs are lost, homes foreclosed upon and families evicted. Scam artists are praying on

the desperate and vulnerable, and family stresses are reaching the breaking point. From these problems arise a host of civil legal problems- problems for which legal help is needed. Those who cannot get the legal help they need often face grave consequences.

The Washington State Office of Civil Legal Aid (OCLA) is an independent judicial branch agency that receives appropriations from the Legislature to administer and oversee the state's investment in civil legal aid services to eligible low-income people. Funding made available through OCLA underwrites a comprehensive, statewide integrated civil legal aid system that brings together the strengths of a flagship legal aid program (the Northwest Justice Project), the unique competencies of small, specialized providers of civil legal aid services and the volunteer efforts of thousands of public and private attorneys. Together, this network delivers critically needed legal information, advice and representation to more than 26,000 low-income households each year, and leverages over $14 million worth of volunteer legal services a year.

In 2003, the Washington Supreme Court's Task Force on Civil Equal Justice Funding issued the first comprehensive assessment of the unmet civil legal needs of low-income people in our state. The task force documented that 75% of low-income households experience at least one civil legal problem each year and that, of these, more than eight in ten could not get the help they needed.

The study further documented that the civil legal needs of the poor affect the most personal and profound issues families can face- physical safety and security, housing and homelessness, access to essential health, nutritional and economic assistance, protection of the rights of vulnerable persons with disabilities and the elderly.

The Office of Civil Legal Aid is required to report on the status of access to the civil justice system for low-income people eligible for state-funded civil aid. As of the publication of this report, the status is grave. Despite increased support from the Washington State Legislature and the implementation of client service delivery efficiencies in recent years, the current economic crisis threatens to overwhelm our state's civil legal aid delivery system. Across the state, thousands of low-income people who desperately need legal help to protect their families, income, homes and health care cannot get the help they need.

While the challenges are daunting, this report offers hope. It sheds light not only on the gravity of the problems facing the civil legal aid delivery system but the real and tangible results achieved for clients faced

with profound personal and family crisis. It documents the magnitude of the contributions made by professional staff and volunteer attorneys throughout the state. And it affirms the wisdom of our state's commitment to ensuring that effective legal help is available for those who face civil legal problems that affect their most basic human needs. While we have a long way to go, our destination is clear. It is demarcated in four simple words carved into the marble of the U.S. Supreme Court building: Equal Justice Under Law.

Текст 4
Early Days: The Railway Mania

Often enough an innovator has at first to contend with popular skepticism or even opposition. Then he has his way and the dust settles for a while, and his old opponents and the public at large hold their peace and observe. Then, if the innovation succeeds and especially if it makes money, very often there is a sudden awesome rush as everybody joins the party, the ancient scoffers often leading the field. So it was with railways. During the 1830-ies the first parts of the main- line inter-city network began to be laid down in Britain, and by 1841 you could travel by train from London to Brighton, Southampton, Bristol, and Birmingham, while branching or extending from the London & Birmingham Railway were lines to Liverpool and Manchester, Leeds, Derby, and York. These railways had not been in business for more than a few years, but they rapidly proved two things to the whole country. First of all, they gave a very useful and convenient service for passengers and freight, which was of great advantage also to the districts served in opening up new markets for their produce. Secondly, the railway companies were profitable, and paid a very reasonable return on their money invested in them.

By 1841 there were some 1,500 miles of railway in operation in Britain. For the next couple of years there was rapid but fairly steady growth. Then government had kept some control over the development of new schemes both by careful debate in Parliament and by requiring them to be approved in draft by a Commission set up for the purpose, which had to consider both the public need for any new railway and also its effect on existing lines. But the Commission was short-lived and was abolished in 1845 out of a feeling that railway promoters knew their own business best, while at the same time a vast rush of new Bills overwhelmed the government machinery. All of a sudden the public caught on to the idea of

a national railway grid, which ‘Punch’ ridiculed by publishing a satirical map of the future, apparently insanely complex, British railway network which, fifty years later, had come to look fairly accurate. One of the biggest laughs had been the idea of railways in the Isle of Man. But as so often when politicians’ and economists’ fashion prompts action, greed also appeared. Many of the schemes of 1845 were ill-considered and not a few were downright fraudulent. For a while it was possible to put one’s name down as a subscriber to a railway scheme, receiving shares for a nominal payment, which one could then resell at a substantial profit, so eager was the throng of investors with spare cash; and of course the sharks gathered. A day was named by which all plans for new line to be considered by the 1845 Parliament had to be submitted, and a near-riot followed, with special trains and stage-coaches bringing promoters from all parts with their boxes of papers and rolls of plans. Porters struggled to close doors of the Board of Trade offices against the pressure of the crowd. It was a brief, mad, spell; a few weeks later some smooth gentlemen had done extremely well out of it, and rather more had done very badly.

In the usual British manner after things have gone spectacularly wrong, the Government carried on exactly as before. During 1844 and 1845 Parliament had laid down a broad legal framework for the railway system, which remained unaltered for the rest of the century. A department of the Board of Trade was set up with powers to regulate matters of railway safety; certain minimum standards of service were laid down, including a requirement that each line should run at least one train a day, at an average overall speed of at least 12mph, carrying passengers at a fare not above a penny a mile; and the state was given power to control or reduce the charges of any company which paid unreasonably large dividends. As an aid to its efforts, Parliament for the first time codified basic Company law and laid down standard legal obligations on the railways, avoiding the need to discuss the administrative matter over again with every fresh scheme. But apart from these administrative provisions, ‘’laisser-faire’’ ruled. The state did not concern itself with the detail of where railways were to be built and imposed no plan or strategy. Provided it took its chance, survived the debate, and raised enough money, any project was as good as any other. There was no second Railway Mania because the public had learnt its lesson.

And in spite of the upheaval, railway construction proceeded apace. By 1850 there were some 6,500 miles of line open, and the railway map of Britain looked not unlike today’s main-line network. There were some

gaps, but not many. The most apparent was the lack of a railway across South Wales, which was not ready until 1852. Twenty years from the opening of the Liverpool & Manchester, therefore, the national railway system was established throughout; later construction was a matter of filling in gaps. In the later part of the 19-th century some of the principal British railway companies had become convinced that speed had no special virtues and that to achieve fast runs required an unwarrantable consumption of locomotive coal. The South Eastern Railway definitely forbade speeds in excess of 60mph in the rule book. Even where companies were in direct rivalry, the one with the longer route very often dictated the time. The small engine policy initiated by Bury on the London & Birmingham and weak underline bridgework that prevented mechanical engineers from building bigger machines made it easy to justify moderate speeds, because thrashing of inadequate locomotives inevitably led to an eruption of live cinders from the chimney and an excessive coal bill.

Pinchpenny restrictions did not apply to the Great Northern, which as a latecomer to London felt its competitive position must be maintained by a reputation for fast travel. This gave edge to its shorter mileage to towns east of the Pennines and even justified expresses over its round-about route to Manchester over the Manchester, Sheffield & Lincolnshire Railway from Retford.

On the Great Western, which had been at pains in earlier years to show the speed capabilities of its 7ft gauge, the trains that averaged much more than 40mph were few and far between; dilatory schedules were made worse by the 10-minute compulsory refreshment stop at Swindon, which was eventually eliminated in 1895 by buying out the lessees, whose rights extended to 1940. In the 1880-ies there were two trains that averaged nearly 46mph between London and Exeter, but on the South Wales line the Irish Boat express to Milford could claim only 35mph. The great awakening came after the retirement of G N Tyrell as superintendent of the line. Whereas in 1887 there were five morning trains from Paddington only one of which could be called express, by the end of the century there were 11 trains in the period, of which eight qualified.

Текст 5
Part-Time Program (Seattle)

Seattle University School of Law is the only institution in Washington offering a part-time program. For more than 30 years, the

School of Law has provided a comprehensive evening curriculum designed for the area's working professionals who want to earn a law degree while continuing to work full-time. Our students boast superb academic records, impressive career credentials and a refreshing range of on-the-job experiences that lend depth and vitality to the practicing bar. Not only do they successfully combine studies with full-time work, many effectively balance job, school and family. Among our alumni are senior partners at blue-chip law firms, executive officers at major Northwest corporations, law professors, legal consultants and political officials. Part-time evening students generally complete requirements for the juris doctor degree in three-and a –half years. They attend classes beginning at 6 p.m. Monday through Thursday during summer, fall and spring terms. Because evening courses are popular with the student body, a high percentage of classes in any given term are scheduled ''after hours''. In fact, in an average semester, more than 25 classes are offered between 5 and 9:30p.m.

Part-Time Program:

Academic Program- First-year students complete their Studies over a 15-month period. By fall of their second year, all part-time students will have completed the identical number of credits as their full-time counterparts. The upper-level curriculum combines required and elective courses taken over seven semesters. Some popular courses are: Basic Real Estate, Bankruptcy, Intellectual Property, Estate Planning, Products Liability, Business Entities, Immigration Law, Individual Income Tax, Employment Discrimination, Family Law, Patent and Trade Secrets Law.

The First-tear Schedule- The prescribed first-year course calendar includes six classes scheduled over 15 months. Because we hold classes four days a week, students take advantage of three-day weekends to complete reading assignments and prepare for class. Here is a sample first-year course schedule:

>First Summer Semester- Criminal Law (Monday through Thursday, 6-8p.m.)

>Fall and Spring Semesters- Contracts, Property, Civil Procedure, legal Writing (Monday, Wednesday (7:30-8:45p.m.); Tuesday, Thursday (6-7:15p.m.); Monday, Wednesday (6-7:15p.m.); and Tuesday (7:30-9:20)).

>Second Summer Semester- Torts (Monday through Thursday, 6-8p.m.)

How to Apply- The application process is the same for full-and part-time prospective students. You must possess a bachelor's degree and register for the Law School Admission Test (LSAT). The test is offered

four times annually: September/October, December, February and June. While the February LSAT results are posted within our application timeline, it is strongly recommended you take the LSAT no later than December of the year prior to that which you wish to enroll (i.e. December 2009 LSAT for 2010 admission). You may request registration materials for the LSAT by going to www.lsac.org or calling 215-968-1001. To be considered for admission, have on file at the School of Law:

1. A completed application for admission and a 60$ application fee.
2. A typed personal statement.
3. The results of your performance on the Law School Admission Test and an LSDAS report.
4. Two letters of recommendation.
5. Resume.

Deadlines-The Admissions Office observes a March 1 priority consideration date. We encourage students interested in the part-time program to apply early due to limited class size.

Tuition and Financial Aid- Tuition for the 2009-2010 academic year is $1,178 per credit hour. Part-time students may apply for federal and private loans. In addition, at the time of admission we consider part-time students for merit-based scholarships; a separate application is not required, with the exception of the Scholars for Justice Award. Please see our website for additional information.

Employer Reimbursements-The School of Law is pleased to partner with employers offering employee tuition reimbursement programs. To participate, accepted students should provide a copy of their employer's reimbursement policy and indicated reimbursement percentage to the law school Business Office.

Learn More About Seattle University School of Law- To receive detailed information about our part-time program and gain an overview of the Law School, call, e-mail, go to our Web site or make an appointment with a member of our Admission and/or Student Financial Services Offices. Better yet, call if you wish to visit and schedule a time to observe an evening class.

Текст 6
Ronald A. Peterson Law Clinic

In the Ronald A. Peterson Law Clinic students earn credit and learn the fundamental skills and values of practicing attorneys by representing

clients under faculty supervision. Some Clinic students are ligitate; others mediate. Some advise small-business owners; others represent clients seeking asylum; others represent clients seeking judicial relief from domestic violence. The clinics operate in state and federal courts, administrative agencies, and international tribunals. Consistent with the law school's mission, the Clinic teaches students the habit of reflection, the value of collaboration and unforgettable lessons about what it takes to make justice a reality in the lives of those who cannot afford to pay for legal services. There are just a few examples of the life-changing work being done by students in the Clinic:

>>Two students from the International Human Rights Clinic traveled to Costa Rica to argue before the InterAmerican Court of Human Rights, the highest tribunal for human rights matters in the hemisphere.

>>Law students in the Immigration Law Clinic helped three immigrants avoid deportation and won asylum for two East African women who had been victims of gender-based abuse and intimidation.

>>Students in the Community Development and Entrepreneurship clinic have helped dozens of clients realize their dreams of establishing community –based businesses.

>>The International human Rights Clinic produced a detailed study of conditions at the Federal Immigration Detention Center in Tacoma. The Study attracted attention from policy makers and media nationwide.

>>Students in the Administrative Law Clinic successfully argued that a state agency had wrongly denied a client essential vision therapy.

>>Students from the Predatory Lending Clinic went to New Orleans to work with Hurricane Katrina survivors who had been victims of post-hurricane fraud.

The clinic offers a variety of clinics taught by experts in their field:

Administrative Law Clinic
Arts Legal Clinic
Bankruptcy Clinic
Community Development and Entrepreneurship Clinic
Domestic Violence Clinic
Immigration Law Clinic
International Human Rights Clinic
Mediation Clinic
Mental Health Court Clinic
Not-for-Profit Organization Clinic
Predatory Lending Clinic
Trusts and Estates/Indian Trusts and Estates Clinic
Youth Advocacy Clinic

The Clinic's practice encompasses a wide range of subjects. Clinic students engage in ligitation, counseling and transactional work (both business and personal). They advocate before state and federal courts and administrative agencies, as well as other domestic and international tribunals. Consistent with the Law School's mission, the clinic teaches students the habit of reflection, the value of collaboration and the true meaning of justice. Seven members of the career faculty teach clinical courses. Their combined teaching and practice experience spans subject matter, practice settings, other law schools and even continents. Students also have the opportunity to choose from several clinical courses taught by adjunct faculty in the areas of their current practice. In a typical semester, more than 60 students enroll in clinical courses. Some clinical courses are open to second –year students. Enrollment in others is restricted to third-year students by the governing court rule.

Clinical Method- Students assume primary responsibility for clinic cases and projects, with faculty facilitating and supporting their efforts. Students conduct interviews, prepare documents, and advocate or negotiate on their clients' behalf. In all clinic courses students help clients plan to achieve their goals. This combination of responsibility and support is the hallmark of the clinic experience. Clinic courses include a classroom component in which students engage in discussions and simulated lawyering activities. The seminars build confidence and provide a forum for experimentation, skill development and interactive reflection.

Текст 7
Seattle University School of Law

A leader in global legal education, Seattle University School of Law understands that lawyers must be conversant in both global and national legal developments. To further this mission, the School of Law is creating new partnerships with outside faculty and institutions, both in the United States and abroad.

International and comparative law program. The School of Law has developed a comprehensive curriculum to provide students the opportunity to achieve expertise in international and comparative matters in both the public and private aspects of international law. Courses include International Environmental Law, International Tax, International Intellectual Property, International Criminal Law, International Human Rights Law, Law and Development and Comparative Law of the Middle East.

The Center for Global Justice. The center furthers the mission of the law school by combining a justice-based approach to globalization with a commitment to academic excellence. Among the center's projects are a speakers series, a student fellows program and internship opportunities. Student fellows work with members of the faculty on a variety of international research and advocacy projects. The center is designed to appeal to and benefit three core constituencies of the law school: students, faculty and the local legal community, including alumni.

Study Abroad Opportunities. The School of Law launched Global Justice Advocacy, a four-week study abroad program in Johannesburg, South Africa, co-sponsored by The Mandela Institute of the University of the Witwatersrand Law School in South Africa. Courses offered include global advocacy, international humanitarian law, international criminal law, and South African constitutional law, and are taught by faculty from Seattle University and the Wits Law School. Equal numbers of U.S. and African students are enrolled, and work together on course projects. The law school is co-sponsored of Summer Legal & Policy Study in Rio de Janeiro, a four-week study abroad program in Brazil offered through a consortium among Seattle University School of Law, Georgia State University College of Law and the University of Tennessee College of Law. Courses offered include international human rights law, international trade law, comparative and international environmental law, public health law and cross-cultural conflict resolution. Courses are taught by U.S. faculty in collaboration with faculty from Rio's top Universities. Each course is designed to maximize opportunities to learn about Brazil, and features Brazilian speakers drawn from law, government and civil society.

International Human Rights. Seattle University School of Law established the first international human rights clinic in the Pacific Northwest, and one of the few such programs on the West Coast. Students work with experienced human rights attorneys to represent individuals and organizations claiming violations of international human rights law. The clinic has worked with some of the premier international human rights agencies in the United States, including the Center for Justice and Accountability in San Francisco and the Center for Constitutional rights in New York, on cases and projects involving human rights violations in South America, the Middle East, Africa and Asia.

Summer Internships and Externships. The law school provides generous funding to students for summer internship placements overseas. Students may secure their own placement or take advantage of dedicated

placements the school has established in Cambodia and Nicaragua. The law school also has established externship programs with some of the premier international organizations in Europe in the areas of international criminal law and international environmental law, as well as judicial externships in Uganda. Students who are selected may work for these organizations and earn academic credit toward graduation.

Legal Writing Training. During the last five years, law school's legal writing faculty have conducted training sessions on effective legal writing for judges and magistrates, practicing attorneys, and law students in Uganda, Kenya, and South Africa. In addition, they have worked with law faculties in those countries on developing legal writing curricula. The same professors are among the founding members of APPEAL, an international organization dedicated to promoting the exchange of ideas, information, and resources about the teaching of legal writing and effective advocacy among academics in the United States and academics in Africa.

Germany Exchange. A semester exchange program with Bucerius Law School allows up to two SU law students to spend the fall 3L or 4L semester in Hamburg, Germany, earning up to 12 credits. In exchange, up to two German students may study at Seattle University School of Law.

Mexico/Latin American initiatives. The Latin America-U.S. Program for Academic and Judicial Exchanges brings academics and judicial officers from Latin America to the United States and sends U.S. academics and judicial officers to Latin America to teach and learn about each other's legal systems. The program exposes students to some of the most important scholars from Latin America, emphasizing the importance of transnational relationships in legal education and providing essential tools for the solution of multi-national challenges such as immigration, terrorism, environmental protection, and resource conservation.

Текст 8
Shattered Economy Fuels Unprecedented Need for Legal Aid

Access to legal aid was already difficult for many Washington residents-the working poor, low-income family, the elderly and disabled, and households on fixed incomes. Devastating downward trends in our current economy compound the problem, making it even more difficult for people to get necessary legal help on urgent matters affecting safety, shelter, economic security and access to health care and other services.

From 2000 to 2006 the poverty rate in Washington state increased by 20% (U.S. Census Bureau) – and this was before the economic meltdown

that has resulted in the loss of more than 180,000 jobs in our state since December 2007. As of March 2009 about 322,000 Washingtonians were unemployed and actively seeking work. Foreclosure rates have skyrocketed. In March 2009, one in every 390 homes in Clark County was in foreclosure; one in every 450 in Pierce County. In February 2009 alone there were 971 new foreclosures in King County, 649 in Pierce County, 478 in Snohomish County and 388 in Clark County.

The current economic crisis has hit families with a range of problems unheard of in good times-skyrocketing unemployment, thousands who have lost health insurance, many thousands more who will lose access to government health insurance through the Basic Health Plan, and a growing epidemic of individuals and families facing eviction, foreclosure and homelessness. Financial crises stress family relationships, leading to increases in domestic violence and related negative family dynamics. And, in their desperation, more and more people find themselves falling victim to predatory lenders and distressed home salvation and debt consolidation scams.

These are people who are turning in record numbers to the state-funded civil legal aid system. The flagship of this system is the Northwest Justice Project (NJP), a statewide nonprofit law firm that maintains a centralized toll-free legal aid hotline and offices in 17 locations throughout the state. Already stretched to its limits, client demand for services has jumped 30% over 2005 levels. During the last six months of 2008, NJP attorneys closed about 1,200 cases per month, compared with about 900 cases per month in 2005.

Due in large part to the economic crisis, the difference between available resources and the need for services- the Justice Gap-is more pronounced than ever. Despite legislative action to increase and maintain state funding for civil legal aid since 2005, the number of people in need of legal aid continues to far exceed the capacity of the state-funded civil legal aid system to meet that need. As was the case in 2003, today the vast majority of low-income residents with compelling legal problems-problems that directly affect personal and family safety and security-cannot get the legal help they need.

Текст 9
Should the House of Lords Be Directly Elected?

(The House of Lords is the upper house of the UK Parliament- the lower house being the dominant and popularly elected House of Commons.

As the upper house the House of Lords plays an important role in scrutinising and holding the government to account for its actions, as well as revising legislation. The membership of the chamber- consisting of peers and representatives of the Church of England- has, however, been a controversial issue for many years. The house was partially reformed in 1999 but further reform lies ahead.)

After decades of relative inaction, reform of the Lords is again high on the political agenda. The Labour government was elected on 1 May 1997 on a manifesto stating that: 'The House of Lords must be reformed. As an initial, self-contained reform, not dependent on further reform in the future, the right of hereditary peers to sit and vote in the House of Lords will be ended by stature. This will be the first stage in a process of reform to make the House of Lords more democratic and representative. The legislative powers of the House of Lords will remain unaltered'.

A bill to implement this 'first stage' of reform was introduced in late 1998. The bill aimed to remove the hereditary peers from the chamber and did not include provision for any further reform. At the same time, however, the government published a white paper announcing that a Royal Commission would be established to consider the options for 'stage two' of reform. Despite the upheaval that the bill would cause to members of the House of Lords, its passage was relatively smooth. The Conservative Party- which stood to lose hundreds of members of the upper house- expressed concerns that Labour might fail to move to stage two. By removing the hereditary peers the government would remove the bias in the upper chamber against Labour, and might be content to leave things there. In the end, however, a compromise was reached whereby a relatively small number of hereditary peers would remain, and with this amendment in return for seeing its bill passed without too much disruption.

The 'transitional' House of Lords. The partially reformed House of Lords met for the first time in November 1999. Because of the commitment to further reform this has been dubbed the 'transitional chamber' by the government. The removal of most of the hereditary peers has cut the size of the chamber by almost half. As a result of an amendment to the House of Lords Bill only 92 out of 759 hereditaries remain; this explains the dramatic reduction in size from 1,330 peers in the unreformed house to 699 in March 2000. The transitional house is also much more politically balanced than its predecessor due to the removal of most of the hereditary peers. The Labour and Conservative parties now have broadly similar numbers of members and the balance of power in the

chamber is decisively held by Liberal Democrat peers, cross-benchers (neutral/independent members) and others (compare Tables 1 and 2). The chamber still includes 26 bishops and archbishops and the 92 hereditary peers who remain as a result of the amendment to the House of Lords Bill. The transitional House of Lords has the same power and responsibilities as its predecessor. However, the early months of its life have seen it playing a more active role. The new balance between the parties has removed some of the stigma of the House of Lords blocking bills. Between November 1999 and March 2000 the government suffered ten defeats on bills in the chamber. These bills will be reconsidered by the House of Commons and then sent to the House of Lords again. Government itself stated that the transitional chamber, despite not being elected, is 'more legitimate' than a house dominated by hereditary peers. It has, however, expressed frustration at the actions of the upper house and questioned the right of an unelected chamber, even after reform, to challenge the elected House of Commons.

The Wakeham Commission. Responsibility for investigating the options for further reform was given to the Royal Commission on Reform of the House of Lords, established in February 1999. The chair of the Commission was Lord Wakeham, formerly a Conservative minister who had served at different times as both leader of the House of Commons and leader of the House of Lords. The Commission was asked to make proposals about the future of the second chamber, taking particular account of recent constitutional changes. These include devolution in Scotland and Wales, the new Human Rights Act, and developing relations with Europe. The Commission was given only 10 months to complete its study and published its report in January 2000. It took written evidence from political parties, other organizations, parliamentarians and members of the public, and held public hearings. These demonstrated diverse views on who should sit in a reformed chamber and what role such a chamber should play. The Royal Commission offered a compromise solution, based to some extent on the chamber's traditions. The upper house would continue to be largely appointed and would have around 550 members. However, there would also be a minority of elected members, who would represent the nations and regions of the UK. The Commission was unable to agree on what proportion of the chamber should be elected and proposed three solutions, with 65, 87 and 195 elected members. The method of appointing members would be changed under the Commission's proposals. Rather than the Prime Minister choosing who was appointed, this right would be given to an independent commission with responsibility for ensuring that the

chamber was balanced in terms of political parties, gender and ethnicity. Members would serve 15-year terms rather than being appointed for life as they are now. Many other features of the chamber would be similar to the present arrangements. The Church of England would continue to be represented, although there would be a small number of seats for representatives of other faiths. The 'law lords' would remain. The powers of the chamber would be largely unchanged, although it would be given some new responsibilities. For example, new constitutional and human rights committees would be established. When the Commission's report was published it was widely criticized as being too cautious. Most of the criticism focused on the proposed balance between elected and appointed members in the chamber. The Liberal Democrats, in particular, had proposed a wholly elected upper house and rejected the largely appointed solution proposed by the Commission.

Lessons from overseas. Around the world there are many countries with two-chamber ('bicameral') parliaments. Of 178 parliamentary democracies world-wide, 66 use this mode. Although many countries used to have upper houses like the House of Lords, these have now all been reformed. There are thus many important lessons to be learnt from outside the UK for the second stage of House of Lords reform. The commonest means of selecting upper house members world-wide is now election. A total of 27 second chambers in the world are largely or wholly 'directly' elected by the people. A further 21 use some form of 'indirect' election (for example election of upper house members by local or regional councillors, who are themselves elected). Canada is the only Western democracy with a largely or wholly appointed second chamber- although a number of countries include a small proportion of appointees in their upper houses. The Canadian upper house (Senate) holds some potentially important lessons for Britain. This chamber is wholly appointed, with appointments made by the Prime Minister. It is very powerful and has the right to block any government bill indefinitely. However, the Senate is widely regarded as illegitimate due to its appointed basis. Consequently, like the House of Lords in recent years, it rarely uses its powers and is subject to calls for reform. The Australian Senate, in contrast, is wholly elected. Its members represent the six states and two territories that constitute the Australian federation. Half of the members are chosen at each general election and so serve for twice as long as members of the lower house. The upper house, unlike the lower house, is elected by proportional representation. It therefore tends to have different political

make-up, with the balance held by small centre parties and independents. The fact that the chamber is elected gives it considerable confidence to intervene in the legislation. It thus plays an important role in the Australian system of government because all proposals must be negotiated with its members, whose party affiliations reflect public opinion. Although the Canadian and Australian senates are powerful, many others have quite limited powers to delay bills. The Spanish Senate, for example, can block ordinary bills for only 2 months. If the government seeks to change the constitution of the country, however, this must be approved by the upper house. It is quite common for upper houses to have this power. It has been suggested that this system should apply to Britain in future, in order to protect the new constitutional settlement put in place in 1997. Another common role for upper houses is to represent the interests of the country's regions or states. For example in Germany, members of the upper house represent the governments of the 16 states. Their involvement in the upper house ensures that their voices are heard by national government and that new policies are devised in collaboration. Examples such as this could be useful in Britain when deciding how the new upper house could connect to devolution. The reformed chamber could potentially have a role in bringing together representatives of Scotland, Wales, Northern Ireland and the English regions.

The future. Further action on House of Lords reform is not expected before the next general election. When that election comes, however, the political parties will need to state in their manifestos what they would seek to do for stage two of reform. Attention used to focus on the anachronism of hereditary peers in the legislature, whereas there is now increasing concern about the role of appointed members and of the powers of prime ministerial patronage which the upper chamber provides. There is growing support for elected members in the chamber, with some reformers arguing that election is the only appropriate method for selecting legislators in the twenty-first century. However, others raise concerns that an elected upper house would be too similar to the House of Commons and would seek to challenge too many government policies. Government is trying to resolve these differences and encouraging the political parties to proceed by consensus. But at present this looks difficult to achieve, and the debate on reform may therefore continue for some time. In the meantime valuable lessons may be learnt from observation of the successes and failures of second chambers overseas.

(Meg Russell is Senior Research Fellow at the Constitution Unit, University College London.)

Текст 10
Should the UK Join the Euro?

YES. Sitting in my Frankfurt office not so very long ago, I was reading in the Financial Times about a speech that John Major, then Prime Minister, had made the previous day. In it he had likened the repeated 'mantra' of continental politicians (that the common currency was going to happen) to an Indian rain dance- 'and just as effective!' He was only reflecting the common British view that we didn't want to have anything to do with it and so, despite the strong political backing for the scheme in most of the other countries, it could somehow be wished away. With the article still in my hand I looked out of the window at the tower block that was to become the headquarters of the European Central Bank. For the umpteenth time I saw all 15 EU Central Bank governors, including Eddie George, the UK governor, file through the front door to attend their monthly meeting in preparation for the common currency. The first Eurocrats, including a strong British contingent, were already being hired to realize the vision. In the face of such evidence of strong political willpower there was clearly no way that the common currency was not going to happen, and anyone who said otherwise was either out of touch or deliberately misleading.

Living abroad gives you a different perspective of your home country. This does not mean negative, but simply more objective. Britain's geography and history, which are of course interrelated, mean that Britons tend to be much more cautious about change. The philosophy of 'if it works, why mend it?' and 'somehow muddling through', so useful in times of national peril, prevails. When the pound note was replaced by a mere coin we were outraged. During the time I lived abroad every single note and coin of the realm was replaced. The new coins caused upset each time they were introduced (but at least they were still called pounds and pence). One of the reasons for introducing the smaller coins was that their value in international terms had shrunk to a fraction of their former worth: the pound had sunk from DM (Deutschmark) 8.30 to a low of DM 2.18. It was becoming absurd, even embarrassing, that the British 10p coin was about 20 times as much. Yet we have the nerve to chortle triumphantly about the fall in the value of the euro since its launch! We need to think objectively about the pros and cons of a common currency. There are sound reasons for the UK's not joining from the outset (although I'm not sure that they outweigh the reasons in favour of being in at the beginning) but, if we analyse the views of opponents, they so often tend to be gut reactions to

unwelcome change. I recently heard someone say that he did not mind if the pound were linked at a fixed (acceptable) rate to the euro but he didn't see why we had to scrap the pound. In other words he was prepared to put the pound on exactly the same footing as the Deutschmark or the French franc is today. There is probably almost as high a proportion of Germans as there would be of Britons who will be sad to see the current notes and coins disappear (although many of these have also changed in recent times). The simple fact is that, being fixed in value in relation to the euro, the German and French currencies already no longer exist except as units of the common currency. Theoretically, any number of different sets of notes and coins could continue to circulate for all time, just as Scottish banknotes at a fixed rate of 1:1 to sterling do in the UK. Alternatively, each country could switch to euro notes and coins on an agreed date but would have its own version, retaining some sort of national symbol along with an otherwise common format. This was seriously considered and then discounted for practical reasons: how could the average shopkeeper be expected to recognise the authenticity of a dozen or more different types of euros in all the denominations? (It's hard enough getting a Scottish banknote accepted in England!) The gut reaction in the UK was naturally one of outraged that, if the country ever did join the euro, the notes and coins circulating would no longer bear the monarch's head.

What is a currency? The notes and coins we see are only symbols that represent the actual currency and are useful in that they are recognized within an economy as being authentic and exchangeable units of that currency. It is hard to argue with the idea that it would be more convenient if all the members of a monetary union used the same symbols throughout their common market in much the same way as the US dollar is used and recognized in all 50 states of that union. (Incidentally, this is despite significantly different economic circumstances in Silicon Valley and, say, the Ozark mountains of Arkansas.) Yet it is the thought of the loss of the uniquely British national symbols on the notes and coins in our daily lives that causes a much stronger emotional reaction than the considerably more important issue of what they symbolise. 'Keeping the pound' would be no different, as I have already argued, from joining the euro but retaining the old symbols for political reasons. This might even happen as the only way full membership could be sold to the British public. I can just hear the Chancellor of the Exchequer telling the British electorate in a referendum that we were going to join the EMU but that, in one of those all-night sessions in Brussels, he had secured a great victory allowing us to 'keep the pound'. This would be as dishonest as an earlier Prime Minister,

Harold Wilson, telling the nation after a major devaluation of the pound that 'the pound in your pocket is still a pound'.

The real issue is whether we want to be a full member of the Economic and Monetary Union (note what the letters EMU stand for- not just a monetary union, as many think, but also an economic one). British politicians are not being honest- and here I agree with opponents of the euro- if they play down the significance of what this means. We signed up unwittingly to a vision of an 'ever- closer union' of European states and every intergovernmental conference since we joined the EEC has aimed at making this vision more of a reality. The legitimate question of opponents is whether we actually do want to be part of it. We can stay in the UK without joining the EMU, but it is ludicrous to suggest that we can play a leading role at the heart of Europe at the same time. We have to understand this, as politicians will not tell it to us straight. Opposition politicians work on the gut reactions to the loss of a national symbol while the government accuses them, falsely, of wanting us to withdraw from the EU. The underlying political issue is ignored by both sides- by the opposition because it's easier to score points by working on the emotions and by the government because it's complicated. The government fears, probably rightly, that any attempt to explain it will deliver them to accusations of giving away our sovereignty. Once again the only way the British will accept this latest major step in the creation of an ever- closer union- if they ever do- will be if they are conned into believing somehow that nothing is going to change. The change is happening with or without us. Do we not be fooled by the 'weakness' of the euro. Low interest rates and low inflation are not generally signs of weakness. Ask British exporters how happy they are with a 'strong' pound. Meanwhile, upward inflationary pressure on our interest rates gives them no reason to believe that it will get easier to sell British products to the UK's main markets. At the same time the transparency of a unified currency and the cost savings from not having to hedge currencies are bringing prices of products in the euro zone closer together and generally at a lower level than the prices prevailing in the UK. It's great when you're on holiday, but what about the fest of the year?

Putting off the question of joining on economic grounds is a cop-out to justify delaying a referendum until there is some hope of its being carried. It is true that Gordon Brown's five economic tests of whether the UK is ready to join the EMU are deliberately fuzzy and that it is up to the government to decide when to tell the people the conditions have been met. It is equally true to say that economic arguments can always be found as to

why Britain should stay out. This is why it's as pointless to defend euro entry on economic grounds as it is to attack it. Both sides ignore- willfully or out of ignorance- that joining the EMU is a political question. Does the UK want to be seen to be playing a leading role as a significant part of this union, or does it wish to sink gently in relative importance? You might like to think about what sort of country or world you want to be living in when you are older.

(Michael Knight was an investment banker in Frankfurt for several years and now runs his own consultancy with offices in Frankfurt and his home in Somerset.)

Текст 11
Should the UK Join the Euro? (cont.)

NO. In October 1990 the UK decided to join the Exchange Rate Mechanism (ERM0 – the precursor to the euro- which pegged the value of sterling at a level that was too high. The result was disastrous and the economy went into recession. The UK had to withdraw from the ER on 'Black Wednesday' in September 1992, when there was a run on the pound by currency speculators, which plunged the economy into a deep crisis. In the months following Black Wednesday, base rates were cut by 40% and the pound was devalued by 15%. Under a single currency neither option would be available because interest rates would be fixed by the European Central Bank and Exchange rates would be fixed for all time. Conformity to a single currency just for the sake of conformity has no merit. Of equal importance is the management of the economy. For the past 20 years successive UK governments have adopted a policy of less government intervention in managing the economy (monetarism), whereas the UK's EU partners tend to favour a more interventionist approach (Keynesianism).

What is appropriate for Europe is not necessarily appropriate for the UK economy. There are major differences between the economy of the UK and that of its European neighbours. In many ways the UK has more in common with the USA. The London stock market is larger than that of the German and French combined, even though individually these countries have a larger GDP than the UK. The UK has much greater reliance on the financial services sector and is the largest exporter of capital in Europe (although the majority is not invested in Europe). The UK receives more inward investment from foreign corporations than any other country in

Europe. ‘Pro-euros’ argue that membership of the single currency is necessary to promote low inflation, low interest rates, economic stability and a pro-business environment. The reality of the euro currency economies is very different. They are low-growth, high-unemployment, high-tax economies with rising inflation. The UK, by comparison, is a high-growth, low-unemployment, low-tax economy with low inflation. The current weakness of the euro reflects international concerns over the structural problems in the major economies. It is precisely because the European economies differ from that of the UK that the UK needs the flexibility to manage its economy in its own way, which it would lose by entering the euro.

The European Economic Community operates through an elected legislative assembly (the European Parliament) and a non-elected legislature (the European Commission). It is overtly a political forum and it makes political decisions. The decision to adopt a single European currency is part of the transition of a community of national states to a federal state of Europe. This is a clearly stated political objective and the question of the UK’s membership of the single currency must be seen in the context of the federal economy. For the federal political state to work it must have a single currency with control over interest rate decisions. To manage the euro economy, however, it must also have control over fiscal policy (i.e. taxation and government spending policies). It is therefore impossible to consider the economic impact of the euro without considering the necessary fiscal conformity that must follow. It is for this reason that there has been pressure from the Commission and several member states- most particularly Germany- to conform fiscal policy across the Community. The interrelationship between the euro and European fiscal control has been established. Unfortunately the high-tax regimes of the euro economies are at odds with the low –tax UK. It has been proven that high taxes frustrate growth. It is no coincidence that Europe has experienced rising unemployment and low-to- negative real GDP growth whereas the UK and the USA have experienced positive real growth. It is important to note that this strong growth has been accompanied by low inflation and historically low interest rates.

There are many emotive statements used by the pro-euro lobby, such as: the euro train is moving and if the UK is not on a board it will be left behind; the UK will not be able to play a ‘leading role in Europe’ if it does not participate in the euro; the UK without the euro will be ostracised from the European economy; most industrialists want to join the euro; it is a

'necessary part' of being in Europe. These are very general statements that can not be validated. The pro-euros have little economic validation for their argument. The problem with the UK's joining the euro is the fundamental imbalance between the UK and the euro economies. The 'train' might have tried to move, but it is broken and needs to be repaired. It is conceivable that at some time in the future, when the other European countries have adopted free-market policies and there is a real convergence between their economies and ours, we could join the single currency. Sir John Craven was the first non-German (and one of only two ever) to join the Vorstand (executive board) of the Deutsche Bank. Deutsche Bank is a conglomerate holding company with interests in banking but also holdings in most of corporate Germany. It effectively represents the German 'big business'. Craven resigned from the Vorstand so that he could campaign against the euro. He was uniquely positioned to see how it really works in 'Euroland' and knew that it was against the interests of the UK. Unshackled by the constraints of the ERM and the euro, the UK has experienced unprecedented prosperity. It has not suffered economically nor is it any less influential in Europe. More European nationals work in the UK than ever before (often because they cannot find comparable jobs in their home markets) and the country has record levels of foreign investment. It seems that the UK can 'survive' very well without the euro and its European neighbours could do worse than to follow its example.

I will, however, grant the pro lobby one concession: if the UK were in the euro, Britons would not have to change currency when they go on holiday to Europe. But then there is still the rest of the world, which does not use the euro, so the problem still exists outside Europe. Pro-euros are euro-fixated and forget that there is a large world economy out there. They do so at their peril.

(Stephen Oxenbridge is Chief Finance Officer for MIP plc, a technology company.)

Текст 12
The Travel and Tourism Industry in Perspective

The travel and tourism industry includes a vast range of businesses that have one thing in common: the providing products and services to travelers. Businesses offering transportation, accommodations, food, drink, shopping, entertainment, recreation, and other hospitality services are all part of the travel and tourism industry. Many of these businesses also

provide products and services to people from the community as well as to travelers. In this respect, hospitality operations are like retail stores, sporting events, or even local festivals- all cater to both the traveling and non-traveling public. They are all ‘partners’ in the travel and tourism industry.

The travel and tourism industry is growing quickly. Contributing to this growth is the fact that many people have more leisure time available, and they often see traveling as an attractive leisure time activity. People travel more as their average work week decreases, as their amount of vacation leave and holiday time increase, and as their real income and disposable income levels increase. For example, people working in professional occupations and those over 55 years of age are more likely to travel. Furthermore, pleasure travel is not just for the rich or near-rich anymore. This is due in part to the widespread use and acceptance of credit cards. Credit cards allow people to charge some or all of their vacation-transportation, accommodations, food, even souvenirs- and to pay for it later, ether all at once or a little at a time. In addition, credit cards provide an easier way to handle vacation spending. They are more secure from theft than cash. They are more convenient than traveler’s checks, which often have to be ordered from the bank one day and picked up on another. One writer has suggested that there are both internal and external motivating factors that influence the desire to travel. Internal factors, which motivate one by creating an internal desire to travel, are referred to as ‘’push’’ elements. Some people see travel as a way to maintain or improve their health; spas and health resorts may be destinations for these individuals. People also travel out of curiosity; they wish to experience new people, places, and cultures. Likewise, the desire to participate in or view sports is an important motivator for many. Obviously, some people travel for pleasure. For others, spiritual or religious concerns provide an incentive. Professional and business needs can motivate travel decisions. The desire to visit one’s friends, relatives, and/ or homeland is another travel incentive. Even prestige- traveling for the purpose of impressing others- is a common reason for travel. External factors, or ’’pull’’ elements, attract travelers to specific areas once their desire to travel has been generated. A destination’s culture, history, and tradition are attractions to many travelers. Geography, wildlife, entertainment, cuisine, and climate are other major attractions. Some people travel to view architecture. Some people travel to shop. Many destinations are known for certain goods, such as Hong Kong suits, Irish crystal, Mexican leather.

Others shop for collectibles as a hobby. Some prefer to travel just for the sake of travel and may ‘’collect’’ countries in much the same way that others collect postage stamps. Some travelers enjoy the travel more than the destination. Cruise ships, first-class air travel, chartered bus trips, and private railcars are examples of travel modes that emphasize pleasurable transportation. Some people travel primarily because they enjoy preparing for a trip (such as learning about a country before visiting it) or because they enjoy the memories of a trip after it has concluded.

There are any other factors affecting where and why people travel. Consider, for example, the increase in travel when airfares decrease or when airlines wage price wars in their competition for business. Pleasure travel is often dominated by cost concerns; more people will travel to places that give them the best value for their vacation dollars. People traveling for business usually do not have this flexibility. They are traveling for business-related purposes and must be at a specific destination at a specific time.

People travel for a wide variety of reasons. Catering to the wants and needs of such a diverse traveling market requires a significant variety of businesses. For example, some hotels cater to the very rich, while others are marketed to people seeking clean, inexpensive accommodations. Retail shops, transportation companies, and other tourism-related businesses offer products and services that differentiate among tourists based upon the reasons they travel and the needs they have as they travel.

Текст 13
The U.S. Patent System

Patents are widely regarded as being a means of protecting inventors. A patent gives an inventor exclusive rights to something he has invented and thereby enables him to share in whatever rewards the invention may bring. That is certainly one of the functions of a patent, but it is only a secondary one. The primary function is social: the society that issues the patent gains access to the invention. The correct order of priorities is reflected in the language of the Constitution, which gives Congress power to ‘’promote the Progress of Science and Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries’’. The patent system that was thereby established, together with the patent systems of other nations, has contributed profoundly to the advance of technology. Patents originally

applied to much more than inventions. For 1,000 years sovereigns and other constituted authorities issued letters patent to proclaim the granting of a special privilege, franchise, monopoly, office, title or honor. By the 16th century several nations were issuing patents that granted exclusive privileges of manufacture and sale to citizens who had invented new devices or processes. In the beginning the requirements for obtaining a U.S. patent were rather simple. Eventually the lack of examination led to a multitude of conflicting claims. The result of investigation was the patent law of 1836, which required that all patent applications be examined to determine the novelty of the claimed invention. In this country a patent is defined by the Patent office, which is part of the Department of commerce, as a ''grant issued by the United States Government giving an inventor the right to exclude all others from making, using, or selling his invention within the U.S., its territories and possessions'' for a specific number of years. A patent, then, does not give its holder the absolute right to do something; it gives him the right to prevent other people from doing something. The distinction is significant for two reasons. First, a patent does not provide immunity from other laws if in the process of putting an invention into practice the patent holder comes into conflict with those laws. Like real property, intellectual property can be owned, used exclusively and protected, but it cannot be used to harm others or to deprive them of their rights. Second, the issuance of a patent does not automatically mean that the state of the art in a particular field will be advanced or that the invention will be used or that someone will benefit by the new knowledge disclosed in the patent. Achievement of these objectives is the function of the process of innovation, which is quite different from and, in some ways, independent of the process of invention. The definition of the two terms is important. Invention involves the conception of an idea; innovation is the process by which an invention or idea is translated into actual use.

What a patent system provides, in the form of a patent, is a 'quid pro quo' between the inventor and society. He receives a limited monopoly, which gives him an opportunity for financial reward if the invention is translated into commercial reality; hence the patent system provides him with an incentive to invent. Billions of dollars are spent annually in the U.S. for research and development and for innovations. Patents play a significant role in international commerce. Patents have an obvious importance to companies that have any degree of technological base. Under present law pending applications for patents are kept secret until a

patent is granted. A new bill proposes that a pending application be published 18 to 24 months after its effective filing date. The purpose of the change would be speed the disclosure of new knowledge. Another change relates to the practice of examining applications for patents. An examination entails a search of technical literature and existing patents to see if the claimed invention is really new. Moreover, the number of applications filed in a year usually exceeds the number of examinations that the Patent Office can complete during the year. For these reasons the examination system is the principal cause of the backlog in the patent Office. The proposed revision would provide standby authority for deferring examinations. An applicant could elect to have his patent application published immediately with examination deferred for up to 5 years. If by then neither he nor a third party had asked for an examination, the invention would go into the public domain unpatented. The change would reduce the work load of the Patent Office, because applications for patents on inventions that proved to have little economic significance probably never would be examined.

Текст 14

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#2 Screen the materials, coatings and processing options suitable for critical components, operating in extreme environments

And the #1 Reason is

Текст 15
Rituals At McDonald's

Each day, on the average, a new McDonald's restaurant opens somewhere in the world. The number of McDonald's outlets today surpasses the total number of fast-food restaurants in the United States in 1945. McDonald's has grown from a single hamburger stand in San-Bernardino, California, into today's international web of thousands of outlets. Have factors less obvious to American natives than relatively low cost, fast service, and taste contributed to McDonald's success? Could it be that natives – in consuming the products and propaganda of McDonald's – are not just eating but experiencing something comparable in certain respects to participation in religious rituals? To answer this question we must briefly review the nature of ritual.

Rituals, we know, are formal- stylized, repetitive, and stereotyped. They are performed in special places at set times. Rituals include liturgical order – set sequences of words and actions laid down by someone other than the current performers. Rituals include also convey information about participants and their cultural traditions. Performed year after year, generation after generation, rituals translate messages, values, and sentiments into action. Rituals are social acts. Inevitably, some participants are more strongly committed than others are to the beliefs on which the rituals are founded. However, just by taking part in a joint public act, people signal that they accept an order that transcends their status as mere individuals.

For several years, like many other Americans, I have occasionally eaten at McDonald's. Eventually I began to notice certain ritual-like aspects of American's behavior at these fast-food restaurants. Tell your fellow Americans that going to McDonald's is similar in some ways to going to church and their bias as natives will reveal itself in laughter, denial, or questions about your sanity. Just as football is a game, Star Wars a movie, and Walt Disney World an amusement park, McDonald's, for natives, is just a place to eat. However, an analysis of what natives do at McDonald's will reveal a very high degree of formal, uniform behavior by staff members and customers alike. It is particularly interesting that this invariance in word and deed has developed without any theological doctrine. McDonald's ritual aspect is founded on the twentieth-century technology, particularly automobiles, television, work away from home, and the short lunch break. It is striking nevertheless that one commercial

organization should be so much more successful than other businesses, the schools, the military, and even many religions in producing behavioral invariance. Factors other than low cost, fast service, and the taste of the food – all of which are approximated by other chains – have contributed to our acceptance of McDonald's and adherence to its rules.

Remarkably when Americans travel abroad, even in countries noted for good food, many visit the local McDonald's outlet. The same factors that lead us to frequent McDonald's at home are responsible. Because Americans are thoroughly familiar with how to eat and more or less what they will pay at McDonald's, in its outlets overseas they have a home away from home. In Paris, whose people aren't known for making tourists, particularly Americans, feel at home McDonald's offers sanctuary. It is after all, an American institution, where natives, programmed by years of prior experience, can feel completely at home. Americans, if they wish, can temporarily reverse roles with their hosts. If American tourists can't be expected to act like the French, neither can the French be expected to act in a culturally appropriate manner at McDonald's. This devotion to McDonald's rests in part on uniformities associated with its outlets, at least in the United States: food, setting, architecture, ambience, acts, and utterances. The McDonald's symbol, the golden arches, is an almost universal landmark, as familiar to Americans as Mickey Mouse, E.T., and the flag. The McDonald's nearest my university is a brick structure whose stained-glass windows have golden arches as their central theme. Sunlight floods in through a skylight that is like the clerestory of a church.

Americans enter a McDonald's restaurant for an ordinary, secular act – eating. However, the surroundings tell us that we are somehow apart from the variability of the world outside. We know what we are going to see, what we are going to say, and what will be said to us. We know what we will eat, how it will taste, and how much it will cost. Behind the counter, agents wear similar attire. Permissible utterances by customer and worker are written above the counter. Throughout the United States, with only minor variation, the menu is in the same place, contains the same items, and has the same prices. The food, again with only minor regional variation, is prepared according to plan and varies little in taste. Obviously, customers are limited in what they can choose. Less obviously, they are limited in what they can say. Each item has its appropriate designation - "large fry", "quarter pounder with cheese". The notice who innocently asks -"What kind of hamburger do you have?" or "What is a Big Mac?" is out of place.

Текст 16
Guatemala: from zero to infinity

More than 4,000 years ago, the Maya established themselves in Central America and, particularly, in this small and spectacular 67,632 square mile country, known today as Guatemala. This paradise, conformed by an advanced Neolithic culture, is inhabited by 24 different ethnic groups that have maintained a common Mayan trait: a special sparkle in the eye, as if by observing the sky so much, they could invent infinity itself. We owe the mathematical discovery of the numeral zero to their intelligent wisdom. Without it, neither the binary system nor the modern computer would exist. Thanks to their celestial observations, the 365 days of the solar year, the lunar periods and even the rotations of Venus were defined. This was a brilliant civilization, ahead of their time, that invented glyphic writing and based their religion on the respect for nature.

This is a country for those who do not only tour around, but do wish to live in unique experiences. Experiences such as learning that the history of the world has many paths and that the Mayan people leaded one of the most beautiful and interesting of them. The Maya spoke with their gods and were able to create one of the most accurate calendars existing today, by gazing incessantly at the sky from their observatories. They also transmitted new forms of medicine, technology, art and craftsmanship on to their descendants...all of this can be enjoyed learning from the friendly Mayans today. Guatemala offers endless expeditions in order to immerse into the Maya legacy: from anthropology to archaeology, textile craftsmanship, coffee plantations, flora and fauna or the architecture.

Nature is experienced intensely in Guatemala through rural tourism, flora and fauna observations, photographic safaris in natural forests and reserves, volcano expeditions...When nature exaggerates, it is able to place three live cones on guard along the world's most beautiful lake, appearing to be bonfires around which the gods watch sleepless. Or it draws an immense rainforest and traces in it the paths where calm rivers irrigate the plains where corn, tobacco, sugarcane and banana grow, as well as the beans from which one of the most delicious coffees in the world is extracted.

If you are one of those people who "cannot stay still" and, in addition, love adventure, it does not stop here: you set your own limit. You can sail in canoe through a river in the middle of the jungle while monkeys, colorful birds and a tapir are watching you. Also, go horseback

riding through the mountains and descend to caves that were once ceremonial grounds of the ancestral Maya. Just let life enrapture you like it has not done it in years. In Guatemala, adventure can be experienced by doing trekking, canoeing, kayaking, rafting, horseback riding, navigating, traveling in 4WD vehicles, visiting caves, exploring the jungle...In Guatemala you will feel like never before while going climbing, mountaineering, mountain biking, hiking, fishing, sailing, diving, playing golf, meditating and finding spirituality. Guatemalan gastronomy is diverse and has an important presence of differently combined spices, depending on each dish's original region. Some regional dishes reveal better than others the true Guatemalan cuisine, like tamales (sweet or salty) or jocon, pepian, and caquic, all different recipes based on spicy meats, prepared differently. If there is a place in the world where a business meeting can be much more than that, it is right here: in Guatemala. Here, every condition is met so that your congress, convention or meeting can be a complete success. You will find magnificent hotels, multi-sized meeting halls and lounges equipped with the highest technology, business centers, and above all, the excellence of their staff. They will share with you their polite spirit, kindness and total disposition to make your meeting and sojourn something out of the ordinary. In Guatemala you will meet hospitable and polite people, in streets as well as in hotels, restaurants and other facilities. They will not hesitate to show you their will to make an unforgettable experience out of your stay.

Any time of the year is appropriate to travel to Guatemala, although the ideal time is during the dry season, from November to April. There are two seasons: the rainy and warmer one, from May to October, and the dry one, from November to April. The rain showers freshen the atmosphere, are short lengthed and usually fall during the afternoons and nights. The average temperature is 20^0C (68^0F) in the highlands and central plateau. The rented vehicle lets the more independent visitor travel around most of the country with plenty of liberty. Collective transportation by land also communicates the main cities with every corner of the country. The larger travel agencies own very comfortable minibuses or shuttles. In any case, traveling by land is easy because the roads are in good shape. Guatemala provides great variety for lodging: from the great international hotel chains found in Guatemala City and the main tourist zones, to the family businesses filled with local charm, campsites with all kinds of facilities, ranches, and even cabins on tree tops. Authentic experiences can be shared with Guatemalans if you stay at guest houses or typical homes located

around the country. There is great supply in Guatemala City and the main cities, offering every type of tourism service, general or specialized.

Guatemala's bio-diversity is one of the most complex in the world. The country holds more than 100 legally declared protected areas, as well as 3 sites that have been declared Cultural Heritage of Humanity by UNESCO: Antigua Guatemala, Quirigia and Tikal. This last one is unique in the world because it is located within the Mayan Biosphere Reserve, also declared Heritage of Humanity by UNESCO. Guatemala's territory measures 67,632 square miles and is traversed by 2 mountain ranges and many rivers, covered by tropical jungles, forested plateaus and various lakes. Its 33 volcanoes, of which 3 remain active, are a singular trait of the country. The official currency is the Quetzal. Banking systems accept American dollars and traveler's checks to be converted to quetzales. All currencies must be changed to American dollars before traveling to Guatemala. You can purchase beautiful textiles, wooden items, jade jewelry, candles and many other handcrafts.

Текст 17
Diets: Is it right to be on a diet?

We all want to be lean (slim) and the term dieting most often refers to the revision of food intake in order to lose weight. So there are a number of problems, associated with dieting. Diets are also observed for a wide range of medical reasons. In the United States, for instance, the interest in dieting is caused in part by a cultural emphasis on slimness, but obesity is considered a genuine medical hazard that puts people at risk for heart diseases, diabetes and other disorders. Many diets are unhealthy and even dangerous if followed for any length of time. Of course, diets also aids in the prevention of different disease such as heart disease, stroke, and cancer. Research has shown that in many cases, diets are successful only on a temporary basis, because most dieters regain the weight, plus more within two years. Many of these dieters try to lose the weight again, and it causes problems with metabolic junction and heart disease.

Another problem is that many of the commercially offered diets emphasize one dietary element at the expense of other and such practices present health problems. These diets are not nutritionally balanced and require vitamin and mineral supplements. As for starvation dieting, this dangerous practice should be attempted only under strict medical supervision. The most sensible approach to weight loss is to begin with a

medical check-up to make certain that no special health problems exist and to get a diet and exercise prescription from a physician. Proper weight loss diets observe good nutritional practices and balanced food intake, including the recommended daily regimens of vitamins and minerals.

But there is a way to a life of eating pleasure without sacrificing the health of mind and body. Food supplies three fundamental body needs: the need for energy, the need for new tissue growth and tissue repair and the need to regulate metabolic function. These needs are met with nutrients in the form of carbohydrates, protein, food, water, vitamins and minerals. The optimum diet contains adequate amounts of each of these nutrients.

Vegetarianism is a kind of dieting which means practice of living solely upon vegetables, fruits, grains, nuts soon, generally for ethical, ascetic or nutritional reasons. Meat, fowl and fish are excluded from all vegetarian diets. But in India, most vegetarians exclude even eggs.

Vegetarianism is the practice of eating only foods from plants and avoiding all animal flesh, including red meat, poultry and fish and sometimes dairy products. People may choose a vegetarian diet because of a variety of religious, philosophical and ethical beliefs. Some people abstain from eating meat for religious reasons. Some people avoid animal products for health reasons. But a meatless diet might result in a protein defficiency, vegetarians need to satisfy their protein needs with vitamin-enriched cereals or vitamin B-12.

Текст 18
Disarmament: Statement by the Delegate of Kazakhstan (UN, 1999)

Mr. Chairman,

Allow me to associate myself with the congratulations extended to you on your election to the important of Chairman of the third session of the Preparatory Committee for the Year 2000 Review Conference of Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), and to express our confidence that under your skilled leadership the work of the Committee will proceed fruitfully and achieve positive results.

Since we attach the great importance to the decisions and resolutions of the 1995 Review and Extension Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, Kazakhstan supports at encouraging the full application and effective implementation of this Treaty. The termless nature of the Treaty strongly reinforces the bases of

international stability and security, and creates prospects for progress towards disarmament. 187 countries are already parties to the treaty. In the last four years alone 9 states have acceded to the NPT, and this is an important step towards ensuring its universality.

The wealth of experience gained in post-conflict development provides an additional impetus to the multilateral negotiations aimed at achieving specific practical solutions in the sphere of security, arms limitation and disarmament. It is universally acknowledged that a priority area of the negotiation process is nuclear disarmament and the strengthening of the non-proliferation regime. At the same time, unless we undertake concrete action in this area, we will never achieve our goal. We must recognize that the problems of nuclear disarmament and non-proliferation nave become interdependent, and that international security can be brought about only through joint efforts by both nuclear and non-nuclear states.

The highest priority role in advancing a solution to these questions in the disarmament field, as we see it, lies with the United Nations. The strength of interaction within the UN will determine the successful progress of the international community towards a secure, stable and prosperous world.

The current session of the Preparatory Committee is taking place at a critical time, when the approach of the new millenium makes it vitally necessary to take careful stock of what has been achieved and to develop reliable parameters for international relations in the future.

Unfortunately, it must be acknowledged that on the threshold of the next century the international community has encountered the threat of the proliferation of nuclear weapons. It is becoming quite evident that the new century will not be a safer one. However, a sense of futility should not dominate the international community. Specific steps are needed to eliminate the nuclear threat.

An important contribution to a practical solution to the problems facing the international community in the area of nuclear non-proliferation has been made by the effective mechanisms produced by the IAEA to monitor the turnover in nuclear materials, strengthen the international safeguards system and establish effective cooperation on questions of nuclear and radiation safety in the treatment of wastes.

Today's world is unimaginable without the broad of atomic energy for peaceful purposes. These include not only atomic energy, but also many nuclear-physics isotope technologies and methods, which have found

their way into virtually all areas of our lives. There is a progressive development of peaceful nuclear technologies, and in these circumstances the task of maintaining and strengthening the non-proliferation regime will continue to be a highly relevant issue.

Kazakhstan attaches great importance to progress in the implementation of the initiative for the establishment of a nuclear weapon-free zone un Central Asia. We are convinced that the zone in Central Asia will constitute an important step towards strengthening the non-proliferation regime, the development of cooperation in the use of nuclear energy for peaceful purposes, the development of cooperation in the ecological rehabilitation of territories which have suffered from radioactive contamination, and will promote general and complete disarmament and a strengthening of regional and international peace and security. Kazakhstan will continue to participate consistently and constructively to establish this zone.

The indefinite extension of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) is one of the most outstanding events in the strengthening of the regime for the non-proliferation of weapons of mass destruction. At the same time, as we see it, there is a clear need to build on that success and to move towards the noble goal of full nuclear disarmament. We hope that the year 2000 Review Conference will achieve successful results. The delegation of Kazakhstan is ready to continue to strengthen its cooperation with the delegations of states to the Treaty to achieve that goal.

Текст 19
Premier V.S. Chernomyrdin, Statement at the 19th Special Session of the UN General Assembly on Environmental Protection, 1997

Mr. President,

First of all, Mr. President, we should like to extend our congratulations on your election to this important post. The Russian delegation shares the general desire for a productive session and will do everything possible to promote the successful conclusion of your important agenda objective.

Russia on the whole approves of the continuation of the implementation of the decisions of the UN conference on the environment and development of 1992. There has been a clearer identification of

priority areas and pressing problems concerning the environment and ensuring sustainable development. We already see in operation the global conventions drawn up in Rio de Janeiro on climate change and biodiversity, and conditions are being established for the launching of new mechanisms for international legal regulation in the area of the environment.

The concept of stable development adopted in Rio has been fleshed out through the holding of subsequent UN for on problems of population, population centers, food security, social development, and enhancing the role of women. This has established a reliable foundation for global partnership for sustainable development.

Much has been done, but there have not yet been qualitative changes towards improving the earth's ecology. There is still a threat of further deterioration of the state of the planet's environment. This is shown by the assessments recently prepared by authoritative international organizations and research-scientific institutes on the ecological situation in the world and future prospects, given the maintenance of present economic models.

The major challenge to sustainable development is being posed by technological innovations in economics in conditions of lightning globalization and growing human pressure on nature, while modern civilization has no alternative which could in fact replace the regulating mechanisms of the biosphere.

This forum must provide an impetus to stimulate international environmental cooperation. It must focus on the elimination of existing gaps and shortcomings. These include the establishment of the best possible conditions for the transfer of ecologically safe technologies, more stable and predictable availability of resources to environmental projects, the development of work to produce a convention on the preservation and rational use of forest resources, etc.

Russia in today's difficult conditions is doing all in its power to support the efforts of the international community to resolve these high priority global problems. An edict of the President of the Russian Federation, Boris Yeltsin, of 1 April 1996 defines the substance of our concept of the country's transition to sustainable development. We are strictly complying with the convention on climate change and the preservation of biological diversity, and are actively participating in other international efforts to realize the concept and practice of sustainable development.

The foundation of our approach to sustainable development stems from Russia's special responsibility for the ecology of the planet. Our

impact on the global environment is extremely significant on an absolute scale, and also regarding the results produced as compared to other technologically advanced states. Russia possesses the largest mass of natural ecosystems on the planet, which act as a reserve for the stability of the global biosphere.

The transition of our country to a market economic system and the fundamental efforts at bringing about the social transformation of society allow for increased responsibility for the state of the environment during the process of the implementation of economic reform, for a more flexible combination of measures of state regulation with economic mechanisms.

We attach great significance to the strengthening of cooperation to counteract the depletion of the earth's ozone layer, which is fraught with tragic dramatic consequences for mankind and for the biosphere.

Russia is interested in full-fledged participation in the Convention against desertification. Practical measures here will follow after the drawing up and adoption of an additional annex to the Convention, reflecting the specific conditions of countries with a transition economy.

We believe that time is ripe to begin immediately the negotiating process to produce an international-legal instrument on forests. We are aware of the consequences of damage caused by the squandering of natural resources and therefore believe that a highest priority objective is the restructuring of the energy sector.

As a country with forests which account for one-fifth of all the large forests of the earth, Russia is extremely concerned for the rational use of and preservation of forests for the needs of our descendants and for all mankind. Forests are not only a resource for economic development but also the "lungs" which absorb, inter alia, those very gases which cause the greenhouse effect and threaten to destabilize the climate system.

Attention must also be paid to such fundamentally important questions as the quality of global drinking water resources; the preservation of the ecosystems of the World ocean; the comprehensive development of energy resources and ecological transportation; urbanization and food security.

We understand that all these problems cannot be solved right away, but our joint effectiveness can and must be stepped up through full and rigorous concern for the interests and genuine potential of all groups of states.

Thank you, Mr. President.

Раздел VI. ЭКОНОМИЧЕСКИЕ ТЕСТЫ

Текст 1
Tasks Performed By an Economic System

Economics, of course, deals with the functioning of economic systems- just as, for example, biology deals with the functioning of biological systems. Perhaps the best way to define the economic system is to describe what it does. A society's economic system must allocate its resources among competing uses, combine and process these resources in such a way as to produce goods and services, determine the amount of various goods and services that will be produced, distribute these goods and services among the society's members, and determine what provision is to be made for the future growth of the society's per capita income. Put in a single sentence, these tasks do not seem quite as awesome as in fact they are. To do justice to each of these tasks, a fuller explanation is needed.

First, the economic system must allocate its resources among competing uses and combine and process these resources to produce the desired level and composition of output. Suppose that the desired level and composition of output is known. There usually are many ways of producing a commodity, and it is not easy to decide which way is best. For example, a plant can use different types and quantities of equipment, different amounts and qualities of raw materials, different amounts and qualities of labor, different locations, different means of transporting and distributing its product, and different ways of informing potential customers of the product's existence. The difficulty of solving this aspect of the problem should not be underestimated.

Second, an economic system must determine the level and composition of output. To what extent should society's resources be used to produce weapons systems? To what extent should they be used to build medical laboratories? To what extent should they be used to produce cotton and wool cloth? To what extent should they be used to produce artificial fibers like nylon? Etc. The enormous complexity of this question, as well as its importance, should be obvious.

Third, the economic system must also determine how the goods and services that are produced are distributed among the members of society. How much of each type of good and service is each person to receive? This is a subject that has generated, and continues to generate, heated controversy.

Fourth, another task of an economic system is to provide for whatever rate of growth of per capita income the society desires and can achieve. The goal of economic growth is a relatively new one; most past societies have had economies that were unprogressive. Regardless of its newness, however, it has come to be regarded a s an extremely important task, particularly in the less-developed countries of Africa, Asia, and South America. There is very strong pressure in these countries for changes in technology, the adoption of superior techniques, increases in the stock of capital resources, and better and more extensive education and training of the labor force. These are viewed as some of the major ways to promote the growth of per capita income. In the industrialized nations, the foal of rapid economic growth has become more controversial in recent years. This had been due in part to the fact that some observers have questioned the extent to which economic growth is worth its costs in social dislocations, pollution, and so forth. But there is no indication that most industrialized nations have lost interest in further economic growth.

Текст 2
Macro vs. Micro

The study of economics is typically divided into two parts: macroeconomics and microeconomics. Macroeconomics focuses on the behavior of an entire economy- the “big picture”. In macroeconomics we worry about such national goals as full employment, control of inflation, and economic growth, without worrying about the well-being or behavior of specific individuals or groups. The essential concern of macroeconomics is to understand and improve the performance of the economy as a whole.

Microeconomics is concerned with the details of this “big picture”. In microeconomics we focus on the individuals, firms, and government agencies that actually comprise the larger economy. Our interest here is in the behavior of individual economic actors. What are their goals? How can they best achieve these goals with their limited resources? How will they respond to various incentives and opportunities?

A primary concern of macroeconomics, for example, is to determine the impact of aggregate consumer spending on total output, employment, and prices. Very little attention is devoted to the actual content of consumer spending or its determinants. Microeconomics, on the other hand, focuses on the specific expenditure decisions of individual consumers and the forces (tastes, prices, incomes) that influence those decisions.

The distinction between macro-and microeconomics is also reflected in discussions of business investment. In macroeconomics we want to know what determines the aggregate rate of business investment and how those expenditures influence the nation's total output, employment, and prices. In microeconomics we focus on the decisions of individual businesses regarding the rate of production, the choice of factors of production, and the pricing of specific goods.

The distinction between macro-and microeconomics is a matter of convenience. In reality, macroeconomic outcomes depend on micro behavior, and micro behavior is affected by macro outcomes. Hence, one cannot fully understand how an economy works until one understands how all the participants behave and why they behave as they do. But just as you can drive a car without knowing how its engine is constructed, you can observe how an economy runs without completely disassembling it. In macroeconomics we observe that car goes faster when the accelerator is depressed and that it slows when the brake is applied. That is all we need to know in most situations. There are times, however, when the car breaks down. When it does, we have to know something more about how the pedals work. This leads us into micro studies. How does each part work? Which ones can or should be fixed?

Our interest in microeconomics is motivated by more than our need to understand how the larger economy works. The "parts" of the economic engine are people. To the extent that we care about the welfare of individuals in society, we have a fundamental interest in microeconomic behavior and outcomes. In this regard, we examine the goals of individual consumers and business firms, seeking to explain how they can maximize their welfare in the economy. In microeconomics, for example, we spend more time looking at which goods are produced, who produces them, and who receives them. In macroeconomics we tend to focus only on how much is produced or how many people are employed in the process.

Theory and reality. The distinction between macroeconomics and microeconomics is one of many simplifications we make in studying economic behavior. The economy is much too vast and complex to describe in one course or one lifetime. Accordingly, we focus on basic relationships, ignoring annoying detail. In doing so, we isolate basic principles of economic behavior, then use those principles to predict economic events and formulate economic policies. What this means is that we formulate theories, or models, of economic behavior, then use those theories to evaluate and design economic policy.

Because all economic models entail simplifying assumptions, they never exactly describe the real world. Nevertheless, the models may be useful. If our models are reasonably consistent with economic reality, they may yield good predictions of economic behavior. Likewise, if our simplifications do not become distortions, they may provide good guidelines for economic policy. Our theory of consumer behavior assumes, for example, a distinct relationship between the price of a good and the quantity people buy. As prices increase, people buy less. In reality, however, people may buy more of a good at increased prices, especially if those high prices create a certain "snob appeal" or if prices are expected to increase still further. In predicting consumer responses to price increases, we typically ignore such possibilities by assuming that the price of the good in question is the only thing that changes. This assumption of "other thing remain equal (unchanged)" (in Latin, ceteris paribus) allows us to make straightforward predictions. If instead we described consumer responses to increased prices in any and all circumstances (allowing everything to change at once), every prediction would be accompanied by a book full of exceptions and qualifications. We would look more like lawyers than economists.

Although the assumption of ceteris paribus makes it easier to formulate economic theory and policy, it also increases the risk of error. Obviously, if other things do change in significant ways, our predictions and policies may fail. But, like weather forecasters, we continue to make predictions, knowing that occasional failure is inevitable. In doing so, we are motivated by the conviction that it is better to be approximately right than to be dead wrong.

Policy. Politicians cannot afford to be quite so complacent about predictions, however. Policy decisions must be made every day. And a politician's continued survival may depend on being more than approximately right. Economists can contribute to those policy decisions by offering measures of economic impact and predictions of economic behavior. But in the real world, those measures and predictions will always contain a substantial margin of error. That is to say, economic policy decisions are always based on some amount of uncertainty. Even the best economic minds cannot foretell the future. Even if the future were known, economic policy could not rely completely on economic theory. There are always political choices to be made. The choice of more submarines or more railroads, for example, is not an economic decision. Rather, it is a sociopolitical decision based in part on economic trade offs (opportunity costs). The 'need' for more subs or more railroads must be expressed politically – ends versus means

again. Political forces are a necessary ingredient in economic policy decisions. That is not to say that all political decisions are right. It does suggest, however, that economic policies may not always conform to economic theory. We shall explore the interaction of policy and theory, highlighting those forces that contribute to disappointing performance.

Controversy. One last word of warning before you go further. Economics claims to be a science, in pursuit of basic truths. We want to understand and explain how the economy works without getting tangled up in subjective value judgments. This may be an impossible task. First of all, it is not clear where the truth lies. For over 200 years economists have been arguing about what makes the economy tick. None of the competing theories has performed spectacularly well. Indeed, few economists have successfully predicted major economic events with any consistency. Even annual forecasts of inflation, unemployment, and output are regularly in error. Worse still, there are never-ending arguments about what caused a major economic event long after it has already occurred. In fact, economists are still arguing over the causes of the Great Depression of 1930s! The most persistent debate in economics has focused on the degree to which the government can improve the economy's performance. Two hundred years ago, Adam Smith convinced most of the world that the economy worked best when it was left alone. In the throes of the Great Depression, the British economist John Maynard Keynes forced people to rethink that conclusion. He convinced people that active government intervention in the marketplace was the only way to ensure economic growth and stability. For nearly 30 years his theory dominated the economics profession and public policy. A decade of disappointing economic performance ended Keynes's overwhelming dominance. The 1970s were fraught with repeated recessions, slow growth, and high inflation. "Supply-siders" and "Monetarists" laid much of the blame on Keynesian theory. Specifically, they argued that we got into economic trouble because we permitted too much government intervention. Excessive government intervention had stifled the market mechanism, they claimed; Keynes's call for active government policy had to be rejected.

Текст 3
Corporation

Corporations are legal entities, distinct and separate from the individuals who own them. As such, these governmentally designated

“legal persons” can acquire resources, own assets, produce and sell products incur debts, extend credit, sue and be sued, and carry on all those functions which any other type of enterprise performs.

Advantages. The advantages of the corporate form of business enterprise have catapulted this type of a firm into a dominant position in modern American capitalism. Although corporations are relatively small in numbers, they are frequently large in size and scale of operations. Although only 18% of all businesses are corporations, they account for roughly nine-tenth of all business sales.

The corporation is by far the most effective form of business organization fro raising money capital. As this chapter’s Last Word reveals, the corporation features unique methods of finance – the selling of stocks and bonds – which allow the firm to tap the savings of untold thousands of households. Through the securities market, corporations can pool the financial resources of extremely large numbers of people. Financing by sale of securities also has decided advantages from the view-point of the purchasers of these securities. First, households can now participate in enterprise and share the expected monetary reward therefrom without having to assume an active part in management. And, in addition, an individual can spread any risks by buying the securities of a variety of corporations. Finally, it is usually easy for the holder of corporate securities to dispose of these holdings. Organized stock exchanges facilitate the transfer of securities among buyers and sellers. Needless to say, this increases the willingness of savers to buy corporate securities. Furthermore, corporations ordinarily have easier access to bank credit than do other types of business organizations. This is the case not only because corporations are better risks but also because they are more likely to provide banks with profitable accounts.

Corporations have the distinct advantage of limited liability. The owners (stockholders) of a corporation risk only what they paid for the stock purchased. Their personal assets are not at stake if the corporation founders on the rocks of bankruptcy. Creditors can sue the corporation as a legal person, but not the owners of the corporation as individuals. Limited liability clearly eases the corporation’s task in acquiring money capital.

Because of their advantage in attracting money capital, successful corporations find it easier to expand the size and scope of their operations and to realize associated advantages. In particular, corporations may be able to take advantage of mass-production technologies. Similarly, size permits greater specialization in the use of human resources. While the manager of a

sole proprietorship may be forced to share her time between production, accounting, and marketing functions, a larger corporation can hire specialized personnel in each of these areas and achieve greater efficiency.

As a legal entity, the corporation has a life independent of its owners and, for that matter, of its individual officers. Proprietorships are subject to sudden and unpredictable demise, but, legally at least, corporations are immortal. The transfer of corporate ownership through the sale of stock will not disrupt the continuity of the corporation. In short, corporations have a certain permanence, lacking in other forms of business organization, which is conducive to long-range planning and growth.

Disadvantages. The corporation's advantages are of tremendous significance and typically override any accompanying disadvantages. Yet, the following drawbacks of the corporate form of organization merit mentioning:

1) There are some red tape and legal expense in obtaining a corporate charter.

2) From the social point of view, it must be noted that the corporate form of enterprise lends itself to certain abuses. Because the corporation is a legal entity, unscrupulous business owners sometimes can avoid personal responsibility for questionable business activities by adopting the corporate form of enterprise. And, despite legislation to the contrary, the corporate form of organization has been a cornerstone for the issue and sale of worthless securities. Note, however, that these potential abuses of the corporate form, not inherent defects.

3) A further possible disadvantage of corporations has to do with the taxation of corporate income. Briefly, there is a problem of double taxation; that part of corporate income which is paid out as dividends to stockholders is taxed twice – once as a part of corporate profits and again as a part of the stockholders' personal incomes.

4) In the sole proprietorship and partnership forms, those who own the real and financial assets of the firm also directly manage or control those assets. Most observers agree that this is as it should be. But, in large corporations where the ownership of common stock is widely diffused over tens or hundreds of thousands of stockholders; a fundamental cleavage between ownership and control will arise. The roots of this cleavage lie in the lethargy of the typical stockholder. Most stockholders simply do not exercise their voting rights, or, if they do, merely sign these rights over by proxy to the corporation's present officers. And why not? Average stockholders know little or nothing about the efficiency with which 'their

‘corporation is being managed. Because the typical stockholder may own only 1000 of 15,000,000 shares of common stock outstanding, one vote “really doesn’t make a bit of difference”! Not voting, or the automatic signing over of one’s proxy to current corporate officials, has the effect of making those officials self-perpetuating.

5) The separation of ownership and control is of no fundamental consequence so long as the actions of the control (management) group and the wishes of the ownership (stockholders) group are in accord. The catch lies in the fact that the interests of the two groups are not always identical. For example, management, seeking the power and prestige which accompany control over a large enterprise, may favor unprofitable expansion of the firm’s operations. Or a conflict of interest can easily develop with respect to current dividend policies. What portion of corporate earnings after taxes should be paid out as dividends, and what amount should be retained by firm as undistributed profits? More obviously, corporation officials may vote themselves large salaries, pensions, bonuses, and so forth, out of corporate earnings which might otherwise be used for increased dividend payments. In short, the separation of ownership and control raises important and intriguing questions about the distribution of power and authority, the accountability of corporate managers, and the possibility of intramural conflicts between managers and shareholders.

Incorporate or not? What determines whether or not a firm incorporates? As our discussion of the corporate form implies, the need for money capital is a critical determinant. The money capital required to establish and to operate a barber shop, a shoe-shine stand, or a small gift shop is modest, making incorporation unnecessary. In contrast, modern technology and a much larger dollar volume of business make incorporation imperative in many lines of production. For example, in most branches of manufacturing – automobiles, steel fabricated metal products, electrical equipment, household appliances, and so forth – very substantial money requirements for investment in fixed assets and for working capital are involved. Given these circumstances, there is no choice but to incorporate. To exist is to incorporate.

Текст 4
Legal Forms of Business Organizations

This section of the chapter continues your introduction to accounting by describing three legal forms for business organizations. Some

differences occur in financial statements depending on the form the company takes. The three forms are single (or sole) proprietorships, partnerships, and corporations.

Single proprietorships. A single proprietorship (or sole proprietorship) is owned by one person and is not organized under state or federal laws as a corporation, which we discuss shortly. Small retail stores and service enterprises are commonly operated as single proprietorships. No special legal requirements must be met to start this kind of businesses.

Legally, a single proprietorship does not have a separate existence apart from its owner. Thus, for example, a court can order the owner's personal assets to be sold to pay the proprietorship's debts. Also, a court can force the proprietorship's assets to be sold to pay the owner's personal debts. Nevertheless, the business entity principle applies in accounting for a single proprietorship. That is, the business is treated as separate and distinct from its owner.

Partnerships. A partnership is owned by two or more people, called partners, and is not organized as a corporation. Like a single proprietorship, no special legal requirements must be met in starting a partnership. All that is required is for the partners to agree to operate a business together. The agreement can be either oral or written. However, a written partnership agreement is better because it helps the partners avoid later disagreements.

For accounting, a partnership is treated under the business entity principle as separate and distinct from its partners. However, just as with a single proprietorship, no legal distinction is made between the partnership and its owners with respect to its debts. That is, a court may order the personal assets of the partners to be sold to pay the business's debts. In fact, the personal assets of a partner may be ordered sold by a court to satisfy all the debts of the partnership, even if this amount exceeds his or her equity in the partnership. This unlimited liability aspect of partnerships can be an important disadvantage of organizing a business with this form.

Corporations. A corporation is a separate legal entity formed, or incorporated, under the laws of a state or the federal government. Unlike a single proprietorship or partnership, a corporation is legally separate and distinct from its owners. The corporation's equity is divided into units called shares of stock. Therefore, the owners of a corporation are called stockholders or shareholders. For example, a corporation that has issued 1,000 shares of stock has divided its equity into 1,000 units. A stockholder who owns 500 shares owns 50% of the equity.

Perhaps the most important characteristic of a corporation is its status as a separate legal entity. This characteristic means that the corporation is responsible for its own acts and its own debts. This arrangement relieves the stockholders of liability for these acts and debts. This limited liability is a major advantage of corporations over proprietorships and partnerships. The separate legal status of a corporation means that it can enter into contracts for which it is solely responsible. For example, a corporation can buy, own, and sell property in its own name. It also can sue and be sued in its own name. In short, the separate legal status enables a corporation to conduct its business affairs with all rights, duties, and responsibilities of a person. Of course, a corporation lacks a physical body, and must act through its managers, who are its legal agents. The separate legal status of a corporation also means that its life is not limited by its owners' lives or by a need for them to remain owners. Thus, a stockholder can sell or transfer shares to another person without affecting the operations of the corporation.

Текст 5
Foundations of Managing Work and Organizations

At the beginning of the 20th century, some managers wanting to improve the practice of management began to put their ideas in writing. These managers were particularly concerned with two issues: 1) increasing the productivity of individuals performing work, and 2) increasing the productivity of organizations within which work is performed. Directing their attention to finding ways to manage work and organizations so that higher levels of output would be produced at lower costs, they created a body of management literature that became known as the classical approach.

The approach is classical because the issues and problems associated with attaining high levels of productivity have enduring importance regardless of time and place. They are as important today as they were at the beginning of the century. In fact, because of today's international competition, some would argue they are more important. The classical writers' ideas for improving productivity are widely practiced in every modern organization, whether public or non-business, profit or nonprofit. The classical approach to management stresses the importance of analyzing the nature of the work to be done and then applying rational principles to plan, organize, and control the work. This approach to

managing reflects the way all modern managers would like to think of themselves. Yet, when the idea of applying objective analysis to management problems first developed almost a century ago, its implications were new and profound, attracting much popular attention.

The emphasis on rational analysis and the application of scientific rigor to facts and information about productivity led to use of the term scientific management to describe the earliest attempts to manage the work of individuals. The first supporters of scientific management were practicing engineers and managers who believed and then demonstrated that work could be done more efficiently and thus more productively. Believing that the most efficient – the best – way to do a job could be determined through analysis of data, they urged managers to study the actual performance of work and to collect objective data on their observations.

While scientific management ideas were developing, classical organization theory began to evolve. Developers of this theory believed that organizations are the settings within which individuals perform jobs – that the organization is a collection of individual jobs – so the organization should also be designed and managed according to principles and practices that stress efficiency and productivity. The combination of ideas from scientific management's concern for productive work and classical organization theory's concern for efficient organizations creates an important body of management knowledge, classical management thought. Managers must know and apply this knowledge to survive both domestic and international competition for resources and products.

Текст 6
The Product or Service Package

After a target market is defined, the second step is to define the "product" – a service concept or service package – that the customer is to receive. What do customers want from the business, and how does the business see that it is provided. The business must identify what the consumer will experience at all stages of the service encounter. Since a service is primarily an intangible act rather than a physical object, it is difficult for a service business to demonstrate its product before the sale, as many manufactured products can be demonstrated. The consumer cannot be so sure, before the fact, of the quality he or she will receive. A potential customer may seek recommendations from satisfied or dissatisfied

customers. Customers often must judge quality during a service or after it is provided. Judgments of quality may be based on a set of implicit psychological benefits as well as the more explicit physical benefits that the customer may receive. A client of an exercise program, for example, may receive feelings of pride, confidence, and well-being, in addition to the physical changes in muscle tone, body dimensions, and percentage of body fat. Hotel and motel customers seek more than just a room in which to spend the night. They expect efforts to ensure privacy, comfort, cleanliness, courtesy and security from fire, burglary, or disturbances.

The design of the package of services a customer receives should address every aspect of the customer's service encounter. This means the service company should take every opportunity to demonstrate its commitment to and skill at providing high-quality service. For example, consider a fine restaurant. The service encounter includes the telephone call by the customer to make reservations. The call should be pleasant and should verify all the pertinent facts such as the name, number of persons, date, time, etc., so that there is no chance of error. The actions of the parking attendant, host or hostess, coat check attendant, waiter or waitress, and any other persons involved should be pleasant and efficient. Naturally, the art of food preparation is important, and all the details of preparing fine meals must be recognized. Even the details of washing silverware, dishes, etc., and the care of the linens are important. The appearance of the building, the grounds, the rest rooms, and the parking facility all enter into the customer's perception of the service encounter. Once all of the elements of a high-quality service encounter have been identified, the staff should be instructed in the parts they play in providing a high-quality service encounter. Training helps to ensure that all participants have the knowledge and skills. Continual efforts must be made to ensure that the organization consistently performs to the standards.

In defining a service package a company can often benefit from customer input. Airline customers naturally expect more than just the right to occupy an assigned seat on a particular flight. They want and expect a pleasant travel experience. But a company has to be more specific about their customer's expectations if it is to meet those expectations through its employees. British Airways conducted market research to determine what factors people consider most important in their flying experiences and how their airline compared to others with regard to these measures. Four factors stood out above the rest as critically important. First, customers expect that employees are genuinely interested in them and will show care and

concern. Second, employees should have the skill and knowledge necessary to provide the services and solve problems. Third, customers expected spontaneity (the frontline people have authority to solve problems that do not fit standard procedures, that is, they are not bound by bureaucracy when they need to act). The fourth factor is called recovery (someone will go out of his or her way to make amends to the customer when something goes wrong).

Airline passengers certainly cannot control the system once they agree to travel with an airline. Many are not familiar with airplanes, airports, and schedules – particularly when something changes from the usual. These factors suggest that passengers expect airline employees to look out for the customers' interests and keep them from being victims of the system. There are often numerous subtle ways that service providers affect customers and therefore numerous opportunities to show exceptional service.

Since services embody so many implicit benefits, it is difficult to know how much service has been provided and to judge the quality of those efforts. An objective in operating the service delivery system is to maximize the perceived benefits to the customer in relation to the cost of providing the service. Achievements of this objective will gain the maximum customer satisfaction and the maximum strategic advantage.

Текст 7
Managing Independent-Demand Inventory

Inventory is very important to many companies because it helps the company respond quickly to customer demand, which is an important element of competitive strategy. Inventories of raw materials or partially processed goods can help a company complete the production cycle in a much shorter time than would otherwise be possible. Inventories of finished goods (independent-demand inventories) of the correct items, within a reasonable distance of points of demand, play an important role in a company's ability to compete in a market for standardized products. A second reason for the importance of inventory is that it represents one of the largest controllable resources in many companies. For some companies, such as wholesalers or retailers, particularly if they operate in leased facilities, inventory may be the primary asset. Capital investments in such assets as facilities or equipment are relatively fixed in comparison to investments in inventory. A company normally cannot add units of

facilities and sell them as easily or as profitably as it can build up and reduce its inventory. The more effective a company's inventory systems, the better able it is to manage its resources and to compete effectively.

An inventory system is a collection of people, equipment, and procedures that function to keep account of the quantity of each item in inventory and to determine which items to buy or produce in what quantities and at what times. Even very simple methods that accomplish these functions cost money to operate. Some inventory systems require transaction reporting to keep track of every instance in which units are added to or taken from the existing inventory. These perpetual inventory records can be expensive, but the additional expense can be justified for products that are relatively expensive to hold in inventory.

How much inventory is enough? Inventory may be desirable, even necessary, for smooth operation and good customer service in many situations. For instance, inventory can be used to reduce the lead time to respond to customer demand, to smooth out the production rate when there are variations in demand, and to protect the company from underestimates of demand (forecast errors) or shortages of supply. Reasons such as these, plus the fact that inventory is considered an asset on a company's balance sheet, have led many companies to carry excessive amounts of inventory. Some companies, for example, the Japanese manufacture Toyota, have become known for their ability to operate with low inventories and to achieve a high inventory turnover. The Japanese approach is to keep in-process inventory low and to achieve quick flow of the product through the production cycle. Being able to respond quickly to demand, companies can work from a shorter-range forecast, which is more accurate, so they need less safety stock to protect from uncertainty. A general objective of materials management is to achieve a flow of items from suppliers to customers with no unjustified costs or delay.

Текст 8
Pricing the Security

Because the syndicate members purchase the stock for redistribution in the marketing channels, they must be careful about the pricing of the stock. When a stock is sold to the public for the first time (i.e., the firm is going public), the managing investment banker will do an in-depth analysis of the company to determine its value. The study will include an analysis of the firm's industry, financial characteristics, and anticipated earnings

and dividend-paying capability. Based on appropriate valuation techniques, a price will be tentatively assigned and will be compared to that enjoyed by similar firms in a given industry. If the industry's average price-earnings ratio is 12, the firm should not stray too far from this norm. Anticipated public demand will also be a major factor in pricing a new issue.

The great majority of the issues handled by investment bankers are, however, additional issues of stock or bonds for the companies already trading publicity. When additional shares are to be issued, the investment bankers will generally set the price at slightly below the current market value. This process, known as under-pricing, will help ensure a receptive market for the securities. At times an investment banker will also handle large blocks of securities for existing stockholders. Because the number of shares may be too large to trade in normal channels, the investment banker will manage the issue and under-price the stock below current prices to the public. Such a process is known as a secondary offering, in contrast to a primary offering, in which new corporate securities are sold.

A problem a company faces when issuing additional securities is the actual or perceived dilution of earnings effect on shares currently outstanding. In the case of the Maxwell Corporation, the 250,000 new shares may represent a 10% increment to shares currently in existence. Perhaps the firm had earnings of $5 million on 2,500,000 shares prior to the offering, indicating earnings per share of $2. With 250,000 new shares to be issued, earnings per share will temporarily slip to $1.82. Of course, the proceeds from the sale of new shares may well be expected to provide the increased earnings necessary to bring earnings back to at least $2. While financial theory dictates that a new equity issue should not be undertaken if it diminishes the overall wealth of current stockholders, there may be a perceived time lag in the recovery of earnings per share as a result of the increased shares outstanding. For this reason, there may be a temporary weakness in a stock when an issue of additional shares is proposed. In most cases, this is overcome with the passage of time.

Another problem may set in when the actual public distribution begins – namely, unanticipated weakness in the stock or bond market. Since the sales group normally has made a firm commitment to purchase stock at a given price for redistribution, it is essential that the price of the stock remain relatively strong. Syndicate members, committed to purchasing the stock at $20 or better, could be in trouble if the sales price fell to $19 or $18. The managing investment banker is generally responsible for stabilizing the offering during the distribution period and

may accomplish this by repurchasing securities as the market price moves below the initial public offering price of $21.50. The period of market stabilization usually lasts two or three days after the initial offering, but it may extend up to 30 days for difficult-to-distribute securities. Ina very poor market environment, stabilization may be virtually impossible to achieve. As a classic example, when Federal Reserve Board Chairman Paul Volcker announced an extreme credit-tightening policy in October 1979, newly underwritten, high-quality IBM bond prices fell dramatically and Salomon Brothers and other investment bankers got trapped into approximately $10 million in losses. The bonds later recovered in value, but the investment bankers had already taken their losses.

Текст 9
Securities

Let us examine the characteristics of each security. Treasury bills are short-term obligations of the federal government and are a popular place to 'park' funds because of a large and active market. Although these securities are originally issued with maturities of 91 days, 182 days, and one year, the investor may buy an outstanding T-bill with as little as one day remaining (perhaps two prior investors have held it for 45 days each). With the government issuing new Treasury bills weekly, a wide range of choices is always available. Treasury bills are unique in that they trade on a discount basis – meaning that the yield you receive takes place as a result of the difference between the price you pay and the maturity value.

Treasury notes are government obligations with a maturity of three to five years, and they may be purchased with short-to intermediate-term funds. Federal agency securities represent the offerings of such governmental organizations as the Federal Home Bank Board and the Federal Land Bank. Though lacking the direct backing of the U.S. Treasury, they are guaranteed by issuing agency and provide all the safety that one would normally require. There is an excellent secondary market for agency securities which allows investors to sell an outstanding issue in an active and liquid market prior to the maturity date. Government agency issues pay slightly higher yields than direct Treasury issues.

Another outlet for investment are certificates of deposit (CD), offered by commercial banks, savings and loans, and other financial institutions. The investor places his or her funds on deposit at a specified rate over a given time period as evidenced by the certificate received. This

is a two-tier market, with small CDs ($500 to 510,000) carrying lower interest rates, while larger CD's ($100,000 and more) have higher interest provisions and a degree of marketability for those who wish to turn over their CD's prior to maturity. The CD market became fully deregulated by the federal government in 1986. CDs are normally insured (guaranteed) by the federal government for up to $100,000.

Comparable in yield and quality to large certificates of deposit, commercial paper represents unsecured promissory notes issued to the public by large business corporations. When Ford Motor Credit Corporation is in need of short-term funds, it may choose to borrow at the bank or expand its credit resources by issuing its commercial paper to the general public in minimum units of $25,000. Commercial paper is usually held to maturity by the investor, with no active secondary market in existence.

Banker's acceptances are short-term securities that generally arise from foreign trade. The acceptance is a draft which is drawn on a bank for payment when presented to the bank. The difference between a draft and a check is that a company does not have to deposit funds at the bank to cover the draft until the bank has accepted the draft for payment and presented it to the company. In the case of banker's acceptances arising from foreign trade, the draft may be accepted by the bank for/wrure'payment of the required amount. This means that the exporter who now holds the banker's acceptance may have to wait 30, 60, or 90 days to collect the money. Because there is an active market for banker's acceptances, the exporter can sell the acceptance on a discount basis to any buyer and in this way receive the money before the importer receives the goods. This provides a good investment opportunity in banker's acceptances. Banker's acceptances rank close behind Treasury bills and certificates of deposits as a vehicle for viable short-term investments.

Another popular international short-term investment arising from foreign trade is the Eurodollar certificate of deposit. The rate on this investment is usually higher than the rates on U.S. Treasury bills and bank certificates of deposit at large U.S. banks. Eurodollars are U.S. dollars held on deposit by foreign banks and in turn loaned out by those banks to anyone seeking dollars. Since the U.S. dollar is the only international currency that is also used as a domestic currency abroad, any country can use it to help pay for goods. Therefore, there is a large market for Eurodollar deposits and loans, mostly centered in the London international banking market.

London Interbank offered Rate (LIBOR) is the rate offered for dollar deposits in the London market. While this is essentially a Eurodollar deposit, the difference is that the deposit is centered in London rather than Paris or Frankfurt or some other part of Europe. LIBOR is often used as base lending rate for U.S. companies who may borrow abroad at a floating interest rate of LIBOR plus a small premium. LIBOR is even being used as a base rate for some U.S. domestic loans to corporations. The use of LIBOR is discussed further in Chapter 21, International Management.

The lowest yielding investment may well be a passbook savings account at a bank or a savings and loan. Although rates on savings accounts are no longer prescribed by federal regulation, they are still a relatively unattractive form of investment in terms of yield.

Of particular interest to the small investor is the money market fund – a product of the tight money periods of the 1970s and early 1980s. For a little as $500 or $1,000, an investor may purchase shares in a money market fund, which in turn reinvests the proceeds in high-yielding $100,000 bank CDs, $25,000-510,000 commercial paper, and other large-denomination, high-yielding securities. The investor then receives his pro rata portion of the interest proceeds daily as a credit to his shares.

Money market funds allow the small businessperson or investor to participate directly in higher yielding securities. All too often in the past, the small investor was forced to place funds in savings accounts yielding 5-5.5 percent, while “smart” money was parked at higher yields in large-unit investments. Examples of money market funds are Dreyfus Liquid assets, Inc. and fidelity Daily Income Trust. The investor can normally write checks on a money market fund. Beginning in December 1982, money market funds got new competition when commercial banks, savings and loans, and credit unions were permitted by the regulatory agencies and Congress to offer money market accounts modeled after the money market funds. Due to deregulation, financial institutions are able to pay competitive market rates on money market deposit accounts. Generally these accounts may have only three deposits and three withdrawals per month, and are not meant to be transaction accounts, but a place to keep excess cash balances. They may be used by individuals or corporations, but are more attractive to smaller firms than to larger firms which have many more alternatives available. These accounts are insured up to $100,000 by federal agencies, which make them slightly less risky than money market funds.

Текст 10
Human Wants and Recources

At the beginning of this chapter, we gave a very brief definition of economics which must now be expanded and explained. We said that economics focuses on the way in which resources are allocated among alternative uses to satisfy human wants. This is a perfectly satisfactory definition, but it does not mean much unless we define what is meant by human wants and by resources. What do these terms mean?

Human wants are the things, services, goods, and circumstances that people desire. Wants vary greatly among individuals and over time for the same individual. Some people like sports, others like books; some want to travel, others want to putter in the yard. An individual's desire for a particular good during a particular period of time is not infinite, but in the aggregate human wants seem to be insatiable. Besides the basic desires for food, shelter, and clothing, which must be fulfilled to some extent if the human organism is to maintain its existence, wants arise from cultural factors. For example, society, often helped along by advertising and other devices to modify tastes, promotes certain images of the "full, rich life," which frequently entail the possession and consumption of certain types of automobiles, houses, appliances, and other goods and services.

Resources are the things or services used to produce goods which can be used to satisfy wants. Economic resources are scarce, while free resources, such as air, are so abundant that they can be obtained without charge. The test of whether a resource is an economic resource or a free resource is price: Economic resources command a nonzero price but free resources do not. In a world where all resources were free, there would be no economic problem since all wants could be satisfied.

An economic resource that is used in the production of a particular good is called an input. In the example in Table 1.1, the inputs in the manufacture of ethanol are labor, corn (and other materials), energy, and manufacturing equipment. Economic resources have alternative uses. A particular resource generally can be used in the production of many types of goods. For example, the labor used by the ethanol manufacturer could be used by many other kinds of firms and in many other kinds of work. Of course, as resources become more specialized, there generally are fewer alternative jobs for them – but there are still some. Even the equipment used to make the ethanol can probably be adapted for somewhat different uses.

Economic resources are of a variety of types. In the 19th century it was customary for economists to classify economic resources into three categories: land, labor, and capital. In recent years this sort of classification has tended to go out of style in part because each category contains such an enormous variety of resources. Nevertheless, it is worthwhile defining each of these general types of resources. Land is a shorthand expression for natural resources. Labor is human effort, both physical and mental. Capital includes equipment, buildings, inventories, raw materials, and other nonhuman producible resources that contribute to the production, marketing, and distribution of goods and services. Note that the economist's definition of capital is different from that of the man in the street who employs the word to mean money. For example, a man with a hot dog stand who has $200 in his pocket may say that he has $200 in capital; but his definition is different from that of the economist who would include in the man's capital the value of his stand, the value of his equipment, the value of his inventory of hot dogs and mustard, and the value of other non-labor resources (other than land) that he uses.

Текст 11
Eurodollar Loans

The Eurodollar market is an important source of short-term loans for many multinational firms and their foreign affiliates. Eurodollars are simply U.S. dollars deposited in European banks. A substantial portion of these deposits are held by European branches of U.S. commercial banks. About 85-90 percent of these deposits are in the form of term deposits with the banks for a specific maturity and a fixed-interest rate. The remaining 10-15 percent of these deposits represents negotiable certificates of deposit with maturities varying from one week to five years or longer. However, maturities of three months, six months, and one year are most common in this market.

Since the early 1960s, the Eurodollar market has established itself as a significant part of world credit markets. The participants in these markets are diverse in character and are geographically widespread. Hundreds of corporations and banks, mostly from the United States, Canada, Western Europe, and Japan, are regular borrowers and depositors in this market. U.S. firms have more than doubled their borrowings in the Eurodollar market during the early 1990s. The lower costs and greater credit availability of the Eurodollar market are often attributed to the smaller

overhead costs for lending banks and the absence of a compensating balance requirement.

The lending rate for borrowers in the Eurodollar market is based on the London Inter-bank Offered Rate (LIBOR), which is the interest rate for large deposits. Interest rates on loans are calculated by adding premiums to this basic rate. The size of this premium varies from 0.25 % to 0.50%, depending on the customer, length of the loan period, size of the loan, and so on. Foe example, Northern Indiana Public Service Company obtained a $75 million, three-year loan from Merrill Lynch International Bank. The utility company offered to pay 0.375 points above LIBOR for the first two years and 0.50 points above for the final year of the loan. Over the years, borrowing in the Eurodollar market has been one eighth to seven eighths of a percentage point cheaper than borrowing at the U.S. prime interest rate. During a recent peak interest rate period in the United States, many cost-conscious domestic borrowers fled to the Eurodollar market. Having seen this trend, some U.S. banks began offering their customers the option of taking a LIBOR-based rate in lieu of the prime rate in order to stay competitive.

Lending in the Eurodollar market is almost exclusively done by commercial banks. Large Eurocurrency loans are often syndicated by a group of participating banks. The loan agreement is put together by a lead bank known as the manager, which is usually one of the largest U.S. or European banks. The manager charges the borrower a once-and-for-all fee or commission of 0.25% to 1% of the loan value. A portion of this fee is kept by the lead bank and the remainder is shared by all the participating banks. The aim of forming a syndicate, of course, is to diversify the risk, which would be too large for any single bank to handle by itself. Multicurrency loans and revolving credit arrangements can also be negotiated in the Eurocurrency market to suit borrowers' needs.

Текст 12
Eurobond Market

When long-term funds are needed, borrowing in the Eurobond market is a viable alternative for leading multinational corporations. The Eurobond issues are sold simultaneously in several different national capital markets, but denominated in a currency different from that of the nation in which the bonds are issued. The most widely used currency in the Eurobond market is the U.S. dollar with almost 67% of all the issues

denominated in that currency. The next currency in importance is the deutsche mark. Eurobond issues are underwritten by an international syndicate of banks and securities firms. Eurobonds of longer than seven years in maturity generally have a sinking-fund provision.

Disclosure requirements in the Eurobond market are much less stringent than those required by the Securities and Exchange Commission (SEC) in the United States. Furthermore, the registration costs in the Eurobond market are lower than those charged in the United States. In addition, the Eurobond market offers tax flexibility for borrowers and investors alike. Since most Eurobonds are issued by a fully owned offshore finance subsidiary that is located in a tax-haven country, such as Luxembourg, there are no withholding taxes on interest paid. All these advantages of Eurobonds enable the borrowers to raise funds at a lower cost. Nevertheless, a caveat may be in order with respect to the effective cost of borrowing in the Eurobonds market.

When a multinational firm borrows by issuing a foreign currency denominated debt issue on a long-term basis, it creates transaction exposure, a kind of foreign exchange risk. If the foreign currency appreciates in value during the bond's life, the cost of servicing the debt could be prohibitively high. Many U.S. multinational firms borrowed at an approximately 7% coupon interest by selling Eurobonds denominated in deutsche marks and Swiss francs in the late 1960s and early1970s. Nevertheless, these U.S. firms experienced an average debt service cost of approximately 13%, which is almost twice as much as the coupon rate. This increased cost occurred because the U.S. dollar fell with respect to these currencies. Therefore, currency selection for denominating Eurobond issues must be made with extreme care and foresight. To lessen the impact of foreign exchange risk, some recently issued Eurobond issues were denominated in multicurrency units.

Текст 13
The Price System And Microeconomics

From the discussion in the previous section it is clear that the price system plays a major role in the way our economy goes about performing the four principal functions that any economic system must perform. It is not the only means by which our economy goes about performing these tasks, but its role is very important. A person who wants to understand the way in which our economic system functions must therefore have at least a

basic knowledge of how the price system works. Microeconomics – or at least a major part of it – is often called price theory because so much of it is concerned so directly with the workings of the price system.

At this point, we are in position to bring together various strands of the preceding discussion in order to describe more fully the nature and purpose of microeconomics. Economics, it will be recalled, deals with the way in which scare resources are allocated among alternative uses to satisfy human wants. Microeconomics is the branch of economics that is concerned with the economic behavior of individual consumers, firms, and resource owners, not with the aggregate changes of the economy. As pointed out in the previous paragraph, one of the principal purposes of microeconomics is to provide an understanding of the workings and effects of the price system, which plays an important role in the way our economy functions.

In the course of providing such as understanding, microeconomics helps to answer questions like: What determines the price of various commodities? What determines the amount that a worker makes? What determines the way that a consumer allocates his or her income among various commodities? What determines how much of a particular commodity will be produced? What determines the number and size of firms in a particular industry? Moreover, in the course of investigating these and related questions, microeconomics has shed considerable light on the kinds of problems discussed at the beginning of this chapter: How should a firm choose among alternative manufacturing processes if it wants to maximize its profits? What sort of pricing policy should it adopt? What kinds of social changes can be made if it agreed that the goal is to make anyone better off if it does not make someone else worse off? What are the advantages and disadvantages of various ways in which industries might be organized?

Prices in a free-enterprise economy are important determinants of what is produced, how it is produced, who receives it, and how rapidly per capita income grows. It behooves us, therefore, to look carefully at how prices themselves are determined in a free-enterprise economy. As a first step toward describing this process, we must define the equilibrium price of a good. The equilibrium is a situation where there is no tendency for change; in other words, it is a situation that can persist. Thus the equilibrium price is a price that can be maintained. Any price that is not the equilibrium price cannot be maintained for long, since there are basic forces at work to stimulate a change in price. The best way to understand

what we mean by equilibrium price is to take a particular case, such as the market of coal. Let's put both the demand curve for coal and supply curve for coal together in the same diagram. The result will help us determine the equilibrium price of coal.

The actual price is all that is observed in the real world. In general, economists simply assume that the actual price will approximate the equilibrium price, which seems reasonable enough, since the basic forces at work tend to push the actual price toward the equilibrium price. Thus, if the demand and supply curves remain fairly stable for a time, the actual price should move toward the equilibrium. But it should not be assumed that this movement is always rapid. Sometimes it takes a long time for the actual price to get close to the equilibrium price. Sometimes the actual price never gets to the equilibrium price because by the time it gets close, the equilibrium price changes. All that safely can be said is that the actual price will move toward the equilibrium price. But of course this information is of great value, both theoretically and practically. For many purposes, all that is required is predicting if the price will move up or down.

Текст 14
The Tastes And Preferences Of The Consumer

Microeconomics is the branch of economics that deals with the behavior of individual decision-making units, one of the most important of which is the consumer. For many purposes the consumer is not an individual but a household; the decisions regarding the purchase of a house or a car, for example, often are household rather than individual decisions. In other cases, however, the individual person is the consumer, as, for example, when he or she buts a meal at a restaurant. Regardless of the precise way in which the consumer is defined, there are millions of consumers in the United States – and they spend a great deal of money. In recent years, the American consumer has spent over $3 trillion per year on final goods and services. About 70% of the final goods and services produced by the American economy go directly to consumers. The rest are sold to business firms, to the government, and in export markets. Moreover, the importance of consumers is not a purely American phenomenon. For example, in our neighbor to the north, Canada, about two-thirds of the final goods and services produced by the Canadian economy go directly to consumers. Similar figures could be cited for many other countries.

Our purpose in this chapter is to present a simple model of consumer behavior that will enable us to predict how much of a particular commodity – hot dogs, paint, housing – a consumer buys during a particular period of time. Clearly, one of the most important determinants of a consumer's behavior is his or her tastes or preferences. After all, some consumers like Joseph Conrad while others like comic books; some like Mozart and others like the Rolling Stones. And it is obvious that these differences in tastes result in quite different decisions by consumers as to what commodities they buy. We present three basic assumptions that the economists make about the nature of the consumer's tastes.

To begin with, suppose that the consumer is confronted with any two market baskets, each containing various quantities of commodities. For example, one market basket might contain 1 ticket to a basketball game and three chocolate bars, while the other might contain 4 bottles of soda and a bus ticket. The first assumption that the economist makes is that consumers can decide whether they prefer the first market basket to the second, whether they prefer the second to the first, or whether they are indifferent between them. This certainly seems to be a plausible assumption.

Second, we assume that the consumer's preferences are transitive. For example, if a man prefers Budweiser to Heineken and Heineken to Coors, he must also prefer Budweiser to Coors. Otherwise his preferences would not be transitive, which would mean that his preferences would be contradictory or inconsistent. Similarly, if he is indifferent between mince pie and pumpkin pie and between pumpkin pie and apple pie, he must also be indifferent between mince pie and apple pie. His tastes may be judged to be shallow or deep, lofty or mean, selfish or generous. This makes no difference to the theory. But his preferences must be transitive. Although not all consumers may exhibit preferences that are transitive, this assumption certainly seems to be a plausible basis for a model of consumer behavior.

Third, we assume that the consumer always prefers more of a commodity to less. For example, if one market basket (a very big one) contains 15 harmonicas and two gallons of gasoline, whereas another market basket (also big) contains 15 harmonicas and one gallon of gasoline, we assume that the first market basket, which unambiguously contains more commodities, is preferred. Also, we assume that, by adding a certain amount of harmonicas to the second market basket, we can make it equally desirable in the eyes of the consumer to the first market basket; that is, we can make the consumer indifferent between them. These assumptions, like the previous two, seem quite plausible.

Текст 15
Monopoly

In microeconomics monopoly, like perfect competition, is a useful model. The conditions defining monopoly are easy to state: there must exist one, and only one, seller in a market. Monopoly, like perfect competition, does not correspond more than approximately to conditions in real industries. But as we have noted several times before, a model must be judged by its predictive ability, not the 'realism' of its assumptions. The theory of monopoly has proved to be a very useful analytical device. Monopoly and perfect competition are opposites in the following sense: the firm in a perfectly competitive market has so many rivals that competition becomes impersonal in the extreme; the firm under monopoly has no rivals at all. Under monopoly, one firm is the sole supplier. There is no competition. It is important to add that the policies adopted by a monopolist are affected by certain indirect and potential forms of competition. Clearly, the monopolist is not completely insulated from the effects of actions taken in the rest of the economy. All commodities are rivals for the consumer's favor. Clearly, this rivalry occurs among different products as well as among the producers of a given commodity. For example, meat competes in this sense with butter, eggs, and even men's suits. Of course, the extent of the competition from other products depends on the extent to which other products are substitutes for the monopolist's product. For example, even if a firm somehow could obtain a monopoly on the supply of steel in a particular market, it would still face considerable competition from producers of aluminum, plastics, and other materials that are reasonably good substitutes for steel.

In addition, the threat of potential competition may act as a brake on the policies of the monopolist. The monopolist may be able to maintain its monopoly position only if it does not extract as much short-run profit as possible. If it sets prices above a certain point, other firms may enter its market and try to break its monopoly. If entry can occur, the monopolist must take this possibility into account. Failure to do so may make it an ex-monopolist.

Why do monopolies arise? There are many reasons, but four seem particularly important. First, a single firm may control the entire supply of a basic input that is required to manufacture a given product. The example that is cited repeatedly to illustrate this situation is the pre-World War 2 aluminum industry. Bauxite is an input used to produce aluminum; and for

some time, practically every source of bauxite in the United States was controlled by the Aluminum Company of America (Alcoa). For this reason Alcoa was, for a long time, the sole producer of aluminum in the US.

Second, a firm may become a monopolist because the average cost of producing the product reaches a minimum at an output rate that is big enough to satisfy the entire market at a price that is profitable. In a situation of this sort, if there is more than one firm producing the product, each must be producing at a higher-than-minimum level of average cost. Each may be inclined to cut the price to increase its output rate and reduce its average costs. The result is likely to be economic warfare – and the survival of a single victor, the monopolist. Cases in which costs behave in this fashion are called natural monopolies. When an industry is a natural monopoly, the public often insists that its behavior be regulated by the government.

Third, a firm may acquire a monopoly over the production of a good by having patents on the product or on certain basic processes that are used in its production. The patent laws of the US permit an inventor to get the exclusive right to make a certain product or to use a particular process (the patent is in force for seventeen years). Patents can be very important in keeping competitors out. For example, Alcoa held important patents on basic production processes used to make aluminum. However, it is often possible to 'invent around' another company's patents. That is, although a firm cannot use a product or process on which another firm has a patent, it may be able to develop a closely related product or process and obtain a patent on it.

Fourth, a firm may become a monopolist because it is awarded a market franchise by a government agency. The firm is granted the exclusive privilege to produce a given good or service in a particular area. In exchange for this right, the firm agrees to allow the government to regulate certain aspects of its behavior and operations. For example, as we see in a later section, the government may set limits on the firm's price. Regardless of the form of regulation, the important point is that the monopoly has been created by the government.

Текст 16
Oligopoly

Having sketched out the theory of monopolistic competition, and having discussed the firm's decision regarding advertising expenditures,

we turn now to oligopoly. Oligopoly is a market structure characterized by a small number of firms and a great deal of interdependence, actual and perceived, among them. Unlike the case of monopolistic competition, oligopolies contain so few firms that each oligopolist formulates its policies with an eye to their effect on its rivals. Since an oligopoly contains a small number of firms, any change in the firm's price or output influences the sales and profits of competitors. Moreover, each firm must recognize that changes in its own policies are likely to elicit changes in the policies of its competitors as well.

Because of this interdependence, the oligopolists face a situation where the optimal decision of one firm depends on what other firms decide to do, and where there is opportunity for both conflict and cooperation. A good example is the American beer industry, in which a handful of firms, led by Anheuser-Busch, account for the bulk of the industry's sales. Each of the major beer producers must take account of the reaction of the others when it formulates its price and output policy, since its optimal strategy is likely to depend in part on how they are likely to respond. Thus, in 1989, when Miller and Coors cut the price of their beers by as much as 25%, they had to anticipate what the reactions of other firms, like Anheuser-Busch, would be. In fact, Anheuser-Busch met their price reduction.

Oligopoly is a common market structure in the United States. The automobile industry is dominated by three domestic firms – General Motors, Ford, and Chrysler – and a handful of foreign producers. Many parts of the electrical equipment industry are dominated by Boeing, General Dynamics, Lockheed, McDonnell Douglas, United Technologies, and a few others. And these are only some highly visible examples. Not all oligopolists are large firms. If two grocery stores exist in an isolated community, they are oligopolists, too; the fact that they are small firms does not change this situation.

There are many reasons for oligopoly, one being economies of scale. In some industries, low costs cannot be achieved unless a firm is producing an output equal to a substantial percentage of the total available market, with the consequence that the number of firms will tend to be rather small. In addition, there may be economies of scale in sales promotion as well as in production, and this too may promote oligopoly. Further, there may be barriers that make it very difficult to enter the industry. Finally, of course, the number of firms in an industry may decrease in response to the desire to weaken competitive pressures.

Текст 17
Collusion And Cartels

Conditions in oligopolistic industries tend to promote collusion, since the number of firms is small and the firms recognize their interdependence. The advantages to the firms of collusion seem obvious: increased profits, decreased uncertainty, and a better opportunity to prevent entry. However, collusive arrangements are often hard to maintain, since once a collusive agreement is made, any of the firms can increase its profits by cheating on the agreement. Moreover, collusive arrangements generally are illegal, at least in the US.

When a collusive arrangement is made openly and formally, it is called a cartel. In many countries in Europe, cartels have been common and legally acceptable. In the US, most collusive agreements, whether secret or open cartels, were declared illegal by the Sherman Antitrust Act, which dates back to 1890. However, this does not mean that such agreements do not exist. For example, there was widespread collusion among American electrical equipment manufacturers during the 1950s. Moreover, trade associations and professional organizations may sometimes perform functions somewhat similar to a cartel.

Suppose that a cartel is established to set a uniform price for a particular product. What price will it charge? To begin with, the cartel must estimate the marginal cost curve for the cartel as a whole. Another important task of a cartel is to distribute the industry's total sales among the firms belonging to the cartel. If the aim of the cartel is to maximize cartel profits, it will allocate sales to firms in such a way that the marginal cost of all firms is equal. Otherwise, the cartel could make more money by reallocating output among firms so as to reduce the cost of producing the cartel's total output.

However, this allocation of output – sometimes called the ideal allocation by economists – is unlikely to occur, since the allocation of output usually determines the allocation of cartel profits. For this reason, allocation decisions are the result of negotiation between firms with varying interests and varying capabilities. This is a political process in which various firms have different amounts of influence. Those with the most influence and the shrewdest negotiators are likely to receive the largest sales quotas, even though this increases total cartel costs. Moreover, high-cost firms are likely to receive larger sales quotas than cost minimization would dictate, since they would be unwilling to accept the

small quotas dictated by cost minimization. In practice there is some evidence that sales are often distributed in accord with a firm's level of sales in the past, or the extent of its productive capacity. Also, a cartel sometimes divides a market geographically, with some firms being given certain regions or countries and other firms being given other regions or countries.

We have already noted that collusive agreements tend to break down. Of course, the difficulty in keeping a cartel from breaking down increases with the numbers of firms in the cartel. A firm that breaks away from a cartel – or secretly cheats – can increase its profits as long as other firms do not the same thing and as long as the cartel does not punish it in some way. But if all firms do this, the cartel breaks down. Consequently, as long as a cartel is not maintained by legal provisions, there is a constant threat to its existence. Its members have an incentive to cheat, and once a few do so, others may follow. Price concessions made secretly by a few 'chiselers' or openly by a few malcontents cut into the sales of cooperative members of the cartel who are induced to match them. Thus, the ranks of the unfaithful are expanded; and ultimately the cartel may break down completely.

Текст 18
Advertising Expenditures

Industries with the characteristics of monopolistic competition spend very large amounts on advertising. Newspapers, which account for about 30% of total advertising expenditure in the United States, are full of advertisements by food stores, clothing stores, and other retailers. How much should a profit-maximizing firm spend on advertising? This is a very important question, and one that has occupied the attention of many economists in the sixty years since Chamberlin's work.

For a particular firm, suppose that the quantity that it sells of its product is a function of the product's price and the level of the firm's advertising expenditure for the product. To maximize its total net profits, a firm must set its advertising expenditures at the level where an extra dollar of advertising results in extra gross profit equal to the extra dollar advertising cost. Thus far, we have considered advertising from the point of view of the firm, rather than of society as a whole. From society's point of view, there are obvious disadvantages stemming from certain kinds of advertising.

To begin with, although private groups like the National Advertising Review Board and government agencies like Federal Trade Commission try to stamp out blatantly deceptive advertising, some advertising misleads, rather than informs, consumers. Many consumers are properly skeptical about advertising claims, but the rest may be duped into making purchasing decisions that are far from optimal from their own point of view (but fine from the advertiser's perspective). In addition, advertising may tend to augment the advertiser's monopoly power and may permit the advertiser more latitude to raise its price and profits. If advertising makes customers recognize certain brands and if it encourages them to be loyal to these brands, sellers may have more power to raise prices without losing sales to competitors. In many retail establishments, advertised brands are priced higher than lesser-known brands. Advertising encourages customers to think that advertised brands are better than other brands, even though they may be essentially the same.

On the other hand, there are also advantages of advertising from a consumer's point of view. The consumer frequently does not know the minimum price that he or she must pay for a commodity, and it is costly and time-consuming for the consumer to shop around in order to obtain this information. For example, it may cost a consumer $12 worth of time and travel expense to locate the store that offers a saving of $10 on the price of item. If so, it is not worthwhile for the consumer to try to locate this store. On the other hand, if advertising (of various stores' prices) enables all consumers to identify and get to the lowest-price seller of this item at an additional cost of only $2, the identification of this lowest-price store is worthwhile – and the consumer will be better off as a result of this advertising.

Based on the foregoing discussion, it is clear that advertising has a variety of social effects, some positive, some negative. To the extent that it provides trustworthy information to consumers about product quality and other matters, its effects may be positive, but if it grossly misleading, they may be negative. To the extent that it enables consumers to shop around for the lowest prices more efficiently and at lower cost, it effects tend to be positive, but if it used to increase the advertiser's monopoly power, they may be negative. Because advertising is of so many kinds, it really is impossible to generalize about whether or not it is socially beneficial. The answer depends on the nature of the advertising and the circumstances under which it takes place. Advertising by retail stores, which informs consumers of the price and availability of goods, is more likely to be

socially beneficial than radio commercials consisting of mindless ditties. Advertising aimed at professional purchasers of equipment is more likely to be socially beneficial than television commercials that feature lots of movie stars and sports heroes but few facts.

Текст 19
The Promotion Of Economic Efficiency

More specifically, microeconomics is concerned with policy issues concerning the allocation of resources. In other words, it deals mainly with questions concerning how inputs should be allocated among industries and how goods should be allocated among consumers. These are general equilibrium problems, since the efficient usage of any input cannot be determined by looking at the market for this input alone, and the efficient output of any commodity cannot be determined by looking at the market for this commodity alone. On the contrary, the efficient allocation of resources between two products depends on the relative strength of the demands for the products and their relative production costs.

To understand the definition of economic efficiency, it is important to recognize an important limitation if microeconomics: there is no scientifically meaningful way to compare the utility levels of various individuals. There is no way that one can state scientifically that a piece of Aunt Mary's apple pie will bring you more satisfaction than it will me, or that your headache is worse than mine. This is because there is no scale on which we can measure pleasure or pain in such a way that interpersonal comparison can be made validly. Because we cannot make interpersonal comparisons of utility, we cannot tell whether one distribution of income is better than another. For example, suppose you receive twice as much income as I do. Economists cannot tell us whether this is a better distribution of income than if I receive twice as much income as you do. This is a value judgment, pure and simple. However, most problems of public policy involve changes in the distribution of income. For example, even a decision to increase the production of numerically controlled machine tools and to reduce the production of conventional machine tools may mean that certain stockholders and workers will gain, while others will lose (since some machine tools firms specialize more heavily than others in the production of numerically controlled tools). Because it is so difficult to evaluate the effects of such a decision on the distribution of income, it is correspondingly difficult to come to any conclusions as to whether or not such a decision is good or bad.

Faced with this problem, economists have adopted a number of approaches, all of which have important difficulties. Some economists simply have paid no attention to the effects of proposed policies on the income distribution. Others have taken the existing income distribution as optimal, while still others have asserted that income distributions exhibiting less inequality of income are preferable to those exhibiting more inequality of income. Purists have argued that we really cannot be sure a change is for the better unless it hurts no member of society. For present purposes, the important thing to note is that practically all economists accept the proposition that a change that harms no one and improves the lot of some people (in their own eyes) is an improvement. This criterion, put forth by Vilfredo Pareto at about the turn of the century and often called the Pareto criterion, evades the question of income distribution. If a change benefits one group of people and harms another group, this criterion is not applicable. Nonetheless, this criterion is by no means useless, as we shall see below, and most economists would agree that all changes that satisfy this criterion should be carried out. That is, they believe that society should make any change that harms no one and that improves the lot of some people. If all such changes are carried out (and thus no opportunity to make such changes remain) the situation is termed economically efficient.

Текст 20
Characteristics Of A Public Good

In this chapter we provide a more complete discussion of the nature of public goods, and the amount of a public good that should be provided to promote economic efficiency. We learned that under the specified conditions and with the proper qualification, a perfectly competitive economy results in an efficient allocation of resources. However, it was assumed that the goods being produced were not public goods.

A public good has two characteristics: it is non-rival and nonexclusive. By non-rival we mean that the marginal cost of providing the good to an additional consumer is zero. Thus a public good can be enjoyed by an extra person without reducing the enjoyment it gives others. Consider the case of national defense. If a baby is born in the US at this moment, he or she can enjoy the protection of our military establishment without reducing the protection it affords the rest of us. Thus national defense is a non-rival good.

By nonexclusive, we mean that people cannot be excluded from consuming the good. Ordinarily, whether or not a person consumes a good

depends on whether or not he or she pay the price. Those who pay for the good can consume it, while those who do not pay cannot consume it. But this is not always the case, as illustrated again by national defense. Once a country has created a military establishment, all citizens enjoy its protection national defense is a nonexclusive good.

A public good is defined here as a good that is both non-rival and nonexclusive. Not all non-rival goods are nonexclusive goods and not all nonexclusive goods are non-rival goods. Consider an uncrowded bridge. If Mr. Smith crosses the bridge, this does not interfere with Mr. Jones's crossing it, which indicates that the use of this bridge is a non-rival good. But it is not a nonexclusive good, as shown by the fact that it is perfectly feasible to charge a fee for crossing the bridge, and to prevent people who do not pay from crossing it.

Public goods will not be provided in the right amounts by the market mechanism, which operates on the principle that those who do not pay for a good cannot consume it. As we have just seen, it is impossible to prevent people from consuming a public good whether or not they pay for it. For example, there is no way to prevent someone from benefiting from national defense, regardless of whether or not he or she helps pay for it. Thus, in many cases, the market mechanism simply is no applicable.

Содержание

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