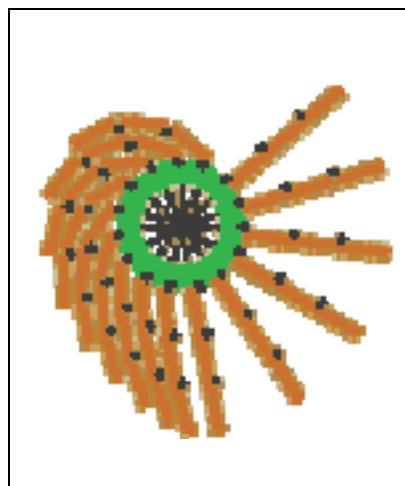


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# INNOVATIONS AND INVENTIONS



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Пособие посвящено рассмотрению проблем инноваций и изобретений последней четверти прошлого века. Каждый из 11 представленных в пособии разделов предполагает самостоятельную работу с оригинальным текстом и снабжен целым рядом заданий, нацеленных на формирование у магистрантов логического мышления, развитие творческого подхода к предлагаемым ситуативным задачам, а также совершенствование навыков говорения и изложения собственного мнения по затронутым проблемам.

Предназначено для аудиторной работы студентов первого курса магистратуры (факультет фундаментальной и прикладной химии).

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## INNOVATION: HISTORICAL BACKGROUNDS

*“Research is to see what everybody else has seen,  
and to think what nobody else has thought.”*  
Albert Szent-Gyorgyi (1893-1986)

### The problem of innovation



The notion ‘innovation’ is very closely connected with the problem of great importance in the history of technology. Strictly speaking, any innovation is something entirely new and original, but the pioneers of inventions and innovations are often not the ones who develop their ideas into commercial success because it is impossible for an inventor to work in a vacuum and, however ingenious his invention is, timing is a matter of luck or of quite exceptional skill. It is obvious that any technological innovation must arise out of an inventor’s own previous experience. The task of distinguishing an element of novelty in an invention is completed according to the patent law down to the present day, but the problem becomes relatively easy by the possession of full documentary records covering previous inventions in many countries.

However, very few such records exist, and it is frequently difficult to explain how particular innovations of the ancients have been introduced to Western Europe. The problem is rather complicated, especially because it is known that many inventions had been developed previously and independently in other civilizations. Moreover, it is sometimes difficult if not impossible to know whether something is spontaneous innovation or an invention that had been transmitted by some yet undiscovered route from those who had originated it in other societies.

The problem is important because it generates a conflict of interpretations about the transmission of technology. On the one hand, the theory exists, according to which all innovation has moved westward from the long-established civilizations of the ancient world, with Egypt and Mesopotamia as the two favourite candidates for the ultimate source of the progress. On the other hand, there is the theory of spontaneous innovation, according to which technological modernization is greatly dependable on the primary social needs. Scholars are yet unable to solve the problem as far as technological advances of the Middle Ages are concerned because much information is missing. Nevertheless, it does seem likely that at least some of the key inventions of that period — such as the windmill and gunpowder — have been developed

spontaneously. It is quite certain, however, that in the early centuries Western civilization, however original its contributions to technological innovation were, addressed to the East for ideas and inspiration.

### **Ancient world technology**

Technology in the ancient world is mostly characterized by the first giant step of fashioning man's own tools. Ancient people observed animals occasionally using sticks or stones for their natural needs. It took many years for a man to arrive at the successive stages of standardizing his simple stone choppers and ploughs and of manufacturing them. A degree of specialization in tool making was achieved by the time of *Neanderthal* man (70,000 BC); more advanced tools, requiring assemblage of head and haft, were produced by *Cro-Magnon Homo sapiens* (perhaps as early as 35,000 BC), while the application of mechanical principles was achieved by pottery-making *Neolithic* man (6000 BC) and by *Metal Age* man (about 3000 BC).

For all except approximately the last 10,000 years, man has lived almost entirely in small nomadic communities, dependent for survival on his skill in gathering food by hunting and fishing and in avoiding predators. It is reasonable to suppose that most of these communities developed in tropical latitudes, especially in Africa, where climatic conditions are most favourable to a creature with such poor bodily protection as man. It is also sensible to expect that tribes of men moved out thence into the subtropical regions and eventually into the landmass of Eurasia. Their colonization of this region must have been severely limited by the successive periods of glaciations, which rendered large parts of it inhospitable and even uninhabitable, even though man has shown remarkable versatility in adapting to such unfavourable conditions.

### **Middle Ages and Western Europe**

The millennium between the collapse of the Western Roman Empire in the 5th century AD and the beginning of the colonial expansion of Western Europe in the late 15th century has been known traditionally as the Middle Ages, and the first half of this period consists of the five centuries of the Dark Ages. In the first place, many of the institutions of the later empire survived the collapse and profoundly influenced the formation of the new civilization that developed in Western Europe. Second, and more important, the Teutonic tribes that moved into a large part of Western Europe did not come empty-handed, and in some respects, their technology was superior to that of the Romans. These tribes appear to have been the first people with sufficiently strong iron plowshares to undertake the systematic settlement of the forested lowlands of Northern and Western Europe, the heavy soils of which had frustrated the agricultural techniques of their predecessors.

The invaders came thus as colonizers. However, the newcomers also provided an element of innovation and vitality. For 500 years, the new

civilization grew in strength and began to experiment in all aspects of human activity. Much of this process involved recovering the knowledge and achievements of the ancient world. The history of medieval technology is thus largely the story of the preservation, recovery, and modification of earlier achievements. Only by the end of the period, Western civilization had begun to produce some remarkable technological innovations that were inevitably to be of the utmost significance.

### **The emergence of Western technology (1500 — 1750)**

The period from 1500 to 1750 witnessed the emergence of Western technology. The superior techniques of Western civilization enabled the nations that composed it to expand their influence over the completely known world. Yet, this period was not marked by any outstanding technological innovation. The only exception of that time was the steam engine developing. However, it was the evolution that, perhaps, became more important than any particular innovation, which has been called ‘the invention of invention’. The creation of a political and social environment conducive to invention, the building up of vast commercial resources to support inventions seemed to produce profitable results. The exploitation of mineral, agricultural, and other raw material resources for industrial purposes, and, above all, the recognition of specific needs for invention and unwillingness to be defeated by difficulties, together created a society maturity for an industrial revolution based on technological innovation. The industrial achievements of the period 1500 — 1750, therefore, must be judged in part by their substantial contribution to the spectacular innovations of the following period.

### **The Industrial Revolution (1750 — 1900)**

The events of the traditional Industrial Revolution had been well prepared in an increasing tempo of industrial, commercial, and technological activity from about AD 1000 and led into a continuing acceleration of the processes of industrialization that is still proceeding in our own time. The notion ‘Industrial Revolution’ is suitable to describe an extraordinary quickening in the rate of growth and change, and more particularly, the first 150 years of this period, as it will be convenient to pursue the developments of the 20th century separately.

The Industrial Revolution, in this sense, has been a worldwide phenomenon, at least as far as it has occurred in all those parts of the world, of which there are very few exceptions, where the influence of Western civilization has been great. Beyond any doubt, it occurred first in Britain, and its effects spread only gradually to continental Europe and North America. It is also clear, that the Industrial Revolution eventually transformed these parts of the Western world and surpassed in magnitude the achievements of Britain. Besides, the process was being carried further to radically change the socioeconomic life of the Far East, Africa, Latin America, and Australasia.

An outstanding feature of the Industrial Revolution has been the advance in power technology. At the beginning of this period, the major sources of power available to industry and any other potential consumer were animate energy and the power of wind and water, the only exception of any significance being the atmospheric steam engines that had been installed for pumping purposes, mainly in coalmines. It should be emphasized that this use of steam power was exceptional and remained so for most industrial purposes until the 19<sup>th</sup> century. Steam did not simply replace other sources of power: it transformed them. The same sort of scientific inquiry that led to the development of the steam engine was also applied to the traditional sources of inanimate energy, due to which both waterwheels and windmills were improved in design and efficiency. Numerous engineers contributed to the refinement of waterwheel construction, and by the middle of the 19<sup>th</sup> century new designs made possible increases in the speed of revolution of the waterwheel and thus prepared the way for the emergence of the water turbine, which is still an extremely efficient device for converting energy.

***Speculate on the following questions:***

1. What do you understand by 'innovation'? Find and give definitions of the notion 'innovation' from different English-English dictionaries, compare them.
2. What do you think about close links between inventors and the environment? What is of more importance?
3. What are general reasons for innovations?
4. Why do you think it is important to protect one's invention?
5. Is it possible to speak of evolution and transmission of innovation? Give your reasons and arguments.
6. What are main ancient innovations? What were the reasons for their appearance?
7. What can you say about the evolution of ancient innovations? Were they improved in any way? Why?
8. What is medieval technology characterized with?
9. What political and social institutions do you think should appear in order to support inventions?
10. Why do you think Industrial Revolution was possible? What was its most outstanding feature?
11. What main achievements of Industrial Revolution do you know?

***Choose one of the topics to prepare an individual report or presentation:***

1. Asian contributions to technology.
2. Classic scholarship of antiquity and the Middle Ages.
3. Great achievements of the 20<sup>th</sup> century.
4. History of technology from Middle Ages to 1750.

5. Life and inventions of Archimedes.
6. Modern technology (nanotechnology).
7. Technology from 1900 to 1945.
8. Technology in the ancient world — Stone Age technology.
9. The Industrial Revolution (1750–1900): the role of Britain.
10. Western contributions to technology.

## Unit 2

### INNOVATIVE ACTIVITY AND CREATIVITY

*“All progress, all success springs from thinking.”*

Thomas Edison (1847-1931)

Being first in the field of inventions is not enough. Innovation is the process that modifies new and original ideas through their thorough development and wide business activity into saleable goods, processes and services in demand.

In economics, business and government policy *everything new* should be substantially different from others, rather than an insignificant change. The innovative activity concerns as a rule both radical and incremental changes to required products, processes and services. The often unspoken goal of innovation is to solve a problem. Innovation is a key issue in the fields of economics, business, technology, sociology and engineering. Since innovation is thought to be a major driver of the economy, the factors that lead to innovation are also critical to policy makers.

In the organizational context, innovation may be linked to its performance and growth through improvements in efficiency, productivity, quality, competitive positioning, market share, etc. All organizations can innovate, including, for example, hospitals, universities and local governments. While innovation typically adds value to some existed thing, it may also have a negative or destructive effect as new developments clear away or change old organizational forms and practices. Organizations that do not innovate effectively may be destroyed by those that do.

In addition, it is of great importance that everyone in the business has the potential to be creative. Each member of the organization has a different viewpoint or may come from a different background. This will help in deliberation of the variety of ideas created. Even the smallest idea can be the cause of an improvement in various spheres.



***Give your opinion on the following questions:***

1. Find the definitions of innovation in different monolingual dictionaries. Compare them.
2. Comment upon the quotation by Thomas Edison.
3. Do you agree that is it absolutely necessary to innovate and create something new? Give your opinion and arguments.
4. Do you agree that all organizations can innovate? Share your view and give some arguments.
5. What do you think are advantages and disadvantages of innovation?
6. What category does innovation belong to?
7. What is your problem solving style?

**Necessity is the mother of invention**

Innovation increases the likelihood of any business succeeding. Nevertheless, innovation itself cannot make the company or organization successful and prospering. There are some factors to be accounted. The success of large established corporations is generally based on their depth of technical expertise and their marketing skills. However, most people do not know where and how to start. People often confuse an innovating process with just an invention. Innovation is more and much wider in the meaning than the latter. It also concerns new ideas, responds to new trends and market conditions as well as introduces improvements into products and services that already exist.

As a starting point of any innovation, one desperately needs strange and unfamiliar ideas. These ideas will form the basis for new products, services or processes, which will meet all the requirements, are the result of a respond opportunity or even solve a chronic problem. The sources of such ideas can arise from any number of areas including trade and different industries, or problems one may have encountered. While there are no concrete and faultless ways to guarantee success in finding or creating great ideas, one of the best ways is to be rather attentive and thoughtful to existed needs and requirements.

In order to start the flow of ideas it is necessary to increase innovation in business. There are a number of basic organizational characteristics to generate and support an innovative business culture. They include the following important features.

- Of great importance are the internal and the external culture of a business in which it operates. Innovation thrives in a business culture that is not afraid of risk-taking, promotes the value of experimenting, is adaptable to changing environment and rewards all positive efforts. An innovation usually needs to be initiated from the top management of the business.

- In order for a business to be innovative, it must be flexible and open to new ideas. Managers need to adopt a positive attitude and focus on the potential for enhancing competitiveness through innovation.

- The allocation of resources for innovation including finance and personnel is dependent on management understanding the benefits of new ideas. Unfortunately, business expenditure on innovation is often referred to as costs rather than investment, and improvements to operational processes may not be considered as innovation at all. Resources should supply innovation, even if it just gives all the participants time to come up with new ideas.

- A free flow of information and ideas in all directions within the business encourages the emergence of new ways of performing and, besides, can lead to the development of new goods. Processes, which allow human resources to suggest improvements and ideas, circulate these novelties to top management and should result in reward for their entrepreneurial behaviour.

- To enhance innovation skills a culture of continuous learning must be widely encouraged by introducing various training programs into the job.

***Speculate on the following questions:***

1. How do you understand the well-known saying “Necessity is the mother of invention”? Give your interpretation.
2. Do you see any difference between innovation and invention?
3. What do you understand by creativity?
4. What is creative potential?
5. Is it possible to develop creativity in a person or is it a gift?
6. What should management strategy according to its personnel be?
7. Do you agree that the top management of the business should lead innovation?
8. Do you think any business can be innovative?
9. What do you understand by information flow in all directions?
10. Is there any difference between expenditure and investment?
11. Which part of the organizational structure in your opinion should create new ideas?

***And now you are offered a test [2, p. 78-88] to see whether you have some creative potential. Answer the questions and make your score!***

**How creative are you?**

1. How would you identify your personality? Would you identify yourself as being:

|                |                    |
|----------------|--------------------|
| • independent  | • a traditionalist |
| • persistent   | • good humoured    |
| • sceptical    | • susceptible      |
| • a risk taker | • timid            |
| • grave        | • highly motivated |

|                                                                                                            |                                                     |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| • apathetic                                                                                                | • cocksure                                          |
| • an iconoclast ( <i>a person who attacks established or traditional concepts, principles, laws, etc</i> ) | • a quitter ( <i>a person who gives up easily</i> ) |

2. In your interpersonal relationships are you:

|                         |                         |
|-------------------------|-------------------------|
| hard to get along with. | an agreeable companion. |
|-------------------------|-------------------------|

3. In your decision making, do

|                          |                              |
|--------------------------|------------------------------|
| hunches play a big role. | you distrust your instincts. |
|--------------------------|------------------------------|

4. What objects and intellectual tasks do you prefer?

|                      |                    |
|----------------------|--------------------|
| complex/asymmetrical | symmetrical/simple |
|----------------------|--------------------|

5. How do you react to disorder?

|                       |                   |
|-----------------------|-------------------|
| It makes you anxious. | You thrive on it. |
|-----------------------|-------------------|

6. Your office/work area is usually

|                |         |
|----------------|---------|
| neat and tidy. | a mess. |
|----------------|---------|

7. Your childhood was marked by

|                            |                                        |
|----------------------------|----------------------------------------|
| • exposure to diversity.   | • harmony.                             |
| • strains in family life.  | • unusual freedom in making decisions. |
| • financial ups and downs. | • obedience.                           |
| • predictability.          | • lack of any adversity.               |

8. In your social habits you are

|                     |                        |
|---------------------|------------------------|
| an introvert loner. | an extravert gadabout. |
|---------------------|------------------------|

9. You feel you are the most efficient and innovative when you work

|                                 |                                                                     |
|---------------------------------|---------------------------------------------------------------------|
| by yourself in peace and quiet. | exchanging ideas with your peers at the cutting edge of your field. |
|---------------------------------|---------------------------------------------------------------------|

10. You usually seek to solve a problem

|                                                           |                                                             |
|-----------------------------------------------------------|-------------------------------------------------------------|
| by systematically organizing and analyzing your thoughts. | with the help of your intuitive and imaginative facilities. |
|-----------------------------------------------------------|-------------------------------------------------------------|

11. Provocative 'what if' questions

|                                            |                          |
|--------------------------------------------|--------------------------|
| make you annoyed, impatient and irritated. | are the sort you relish. |
|--------------------------------------------|--------------------------|

***You have one minute to get the gist of the following text.***

***What is your opinion about having special creative courses at the universities?***

Creativity is a privilege of artists and has certainly no role in business. Right? Wrong!

Several universities, including Stanford, Syracuse and Harvard, offer creativity courses to business students. Creativity consultants help companies to explore problem-solving techniques.

Why is there all this excitement about creativity?

Medical research that enables scientists to see the activity in the brain shows that both sides of the brain flicker on and off when a person is engaged in creative thought. Creativity is not just one intellectual capacity you are either endowed with or deprived of; studies support the theory that creativity is the ability to use different modes of thought (analytical, intuitive, verbal, and emotional).

Some people have more innate potential to be creative than others but experts insist it is a skill that can — and should — be fostered.

***Which of the following statements would you agree with?***

***Discuss your views in threes or fours.***

1. Modern education, which stresses logic, fosters creativity.
2. To be a creative thinker, an exceptionally high IQ is more important than values and personality.
3. In most fields, creative inspiration works best after years of grant work.
4. One should follow the rules instead of wasting time questioning them.
5. Being practical leads to the greatest efficiency.
6. Trying to find the ONLY right answer may stifle your creative impulses.
7. Creativity is a combination of different types of thinking: analytical, logical, verbal, intuitive and emotional.
8. Creativity is a divine gift that cannot be explained, and therefore cannot be learnt.

***Below come some of the creative problem-solving techniques experts favour.***

***Your task is to restore these principles.***

***However, while restoring you should follow some rules. Prepositions, auxiliary verbs and indefinite articles are left in the statements without any changes (these are the words in italics). In the rest words, vowels are missed. In order to figure out these techniques insert the skipped vowels.***

1. NDRSTND *AND* DFN TH PRBLM.
2. RLX, PT RSLF *IN A* PLFL HMRS MD.

3. GNRT SVRL LTRNTVS BFR PSSNG *ANY* JDGMNT.
4. CMBN XSTNG LMNTS *IN A* NW W.
5. FNTSZ: G THRGH WRD-SSCTN XRCSS.
6. S NLG: FND OUT HW A SMLR PRBLM IS SLVD IN NTR OR SM THR SPCT OF LF.
7. RSTT TH PRBLM IN A PRDX; THN FND AN NLG THT SLVS IT.
8. NGG BTH TH CNSCS *AND* SBCNSCS PRTS *OF* TH BRN.
9. D NT QSH NBD'S CRTV FLSHS.

***Remember these stages and I hope you can use them in future!***

Unit 3

### **TYPES OF INNOVATION**

*“All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident.”*

Arthur Schopenhauer (1788-1860)

The concept of innovation implies different types of innovation as well as the way innovation exists within a system. The electronic encyclopedia *Wikipedia* [3] gives several classic definitions of innovation from different sources. They are as follows:

- the process of making improvements by introducing something new (*Wikipedia*),
- the act of introducing something new (*The American Heritage Dictionary*),
- the introduction of something new (*Merriam-Webster Online*),
- a new idea, method or device (*Merriam-Webster Online*),
- the successful exploitation of new ideas (*Dept. of Trade and Industry, UK*),
- change that creates a new dimension of performance (*Hesselbein, 2002*).

Scholars have identified a variety of types of innovation including the following.

- Business model innovation involves changing the way business is done in terms of capturing value (Compaq vs. Dell, hub and spoke airlines vs. Southwest, Hertz/Avis vs. Enterprise).
- Marketing innovation is the development of new marketing methods with improvement in product design or packaging, product promotion or pricing.

- Organizational innovation involves the creation or alteration of business structures, practices and models.
- Process innovation involves the implementation of a new or significantly improved production or delivery method.
- Product innovation involves the introduction of a new good or service that is new or substantially improved. This might include improvements in functional characteristics, technical abilities, ease of use or any other dimension.
- Service innovation is similar to product innovation except that the innovation relates to services rather than to products.
- Supply chain innovation where innovations occur in the sourcing of input products from suppliers and the delivery of output products to customers.

For example, financial innovation through which new financial services and products are developed by combining basic financial attributes (ownership, risk-sharing, liquidity, credit) in progressive innovative ways, as well as reactive exploration of borders and strength of tax law. The dynamic spectrum of financial innovation where business processes, services and products are adapted and improved helps new valuable chains emerge.

***Give your opinion on the following questions:***

1. Enumerate all large companies of your country as well as foreign ones that you know.
2. What marketing methods do you know?
3. What organizational structures are you aware of?
4. What innovation processes can be used?
5. Are you aware of any delivery methods?
6. What in your opinion is the most effective supply chain?
7. Give examples of each type of mentioned innovations.

We have already mentioned that innovations need some social and political institutions for defending as well as promoting them. It is understood that every institution has its own original structure. Nevertheless, there are several common features in all organizations. Every company or firm have separate departments characterized by specific functions.

***Read the text about an organization with a typical structure. Complete the structural chart [4, p. 13] according to the mentioned specification of the departments.***

***Before reading, you have to unscramble the words given in the brackets. Be careful: some words are just anagrams; the others contain all the letters being in the introduced words.***

I think we have a typical (*organza + it + I + on*) for a (*figura + man + cut + n*) firm. We have (*did + dive*) into (*face + inn*), (*drop + cut + ion*), (*tram + king + e*) and (*man + uh*) (*cure + SOS + re*) (*pram + need + 2T + s*).

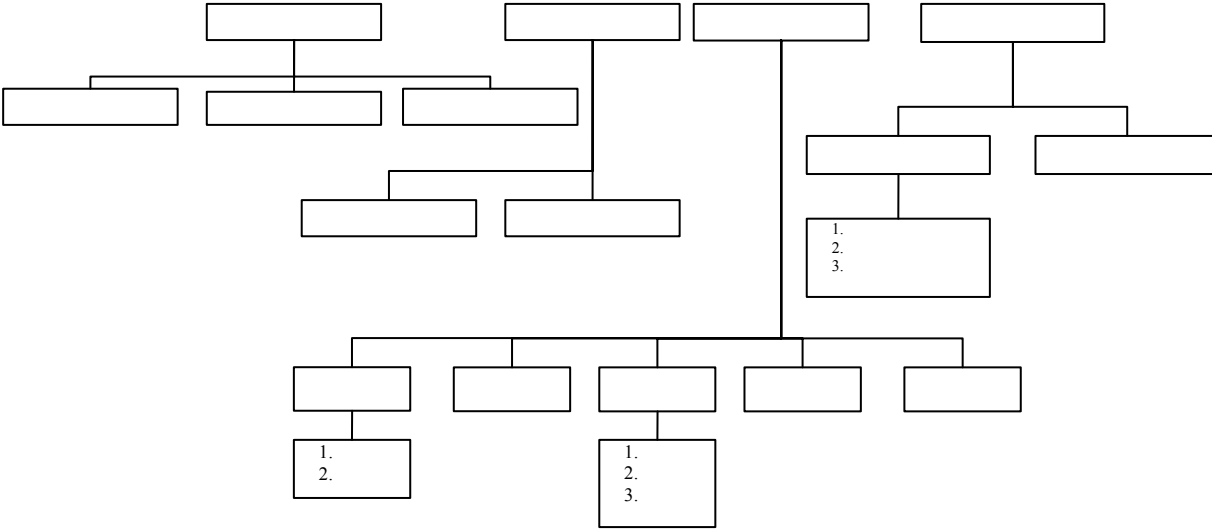
The (*Hun + ma*) (*sour + see + c + r*) (*part + teen + d + m*) is the (*less + tip + m*). It (*tin + so + 2S + c*) of two (*noticess*). One is (*pin + bless + ore*) for (*run + it + meet + r + c*) and (*Perl + son + en*) (*term + at + s*), the other is in (*ache + r + g*) of (*rain + tin + g*).

The (*make + ring + t*) (*met + d + art + pen*) is made up of three (*insect + so*): (*ass + el*), (*less + a*) (*moor + point*), and (*sing + dive + art*), whose (*sad + he*) are all (*table + can + UOC*) to the (*kretingam*) (*anger + am*).

The (*doctor + in + up*) (*tent + map + red*) consists of five sections. The first of these is (*crop + nut + IOD*) (*root + l + c + n*), which is in charge of both (*Schuldinge*) and (*real + it + Sam*) (*not + col + r*). Then there's (*urchin + sap + g*), (*gun + turn + if + ma + Ca*), (*quit + lay*) (*lot + corn*), and (*reign + Ginn + 3e + r*) (*sort + up + p*). (*Ma + fun + act + unrig*) contains three (*nests + CIO*): (*lit + no + go*), (*mass + Bel + y*), and (*factor + bin + I + a*).

(*CEA + Finn*) is composed of two parts: (*facial + inn*) (*ten + men + Maga*), which is responsible for (*cat + a + lip*) (*quiet + men + res*), (*DUF + n*) (*torn + loc*), and (*direct*), and (*noun + cat + cig*).

**An Organization Chart**



- Dwell on the topics introduced in the form of the questions:**
1. What do you think are the main functions of each department?
  2. Which department do you consider the most important?
  3. Which department should be the most innovative?

**Match the verbs with appropriate nouns in the table below. Sometimes there is more than one possibility.**

|                 | designs | ideas | problems | invention | solutions | tests | research |
|-----------------|---------|-------|----------|-----------|-----------|-------|----------|
| market          |         |       |          |           |           |       |          |
| brainstorm      |         |       |          |           |           |       |          |
| promote         |         |       |          |           |           |       |          |
| do              |         |       |          |           |           |       |          |
| conduct         |         |       |          |           |           |       |          |
| develop         |         |       |          |           |           |       |          |
| hide            |         |       |          |           |           |       |          |
| register        |         |       |          |           |           |       |          |
| find            |         |       |          |           |           |       |          |
| patent          |         |       |          |           |           |       |          |
| solve           |         |       |          |           |           |       |          |
| abandon         |         |       |          |           |           |       |          |
| tackle          |         |       |          |           |           |       |          |
| analyse         |         |       |          |           |           |       |          |
| carry out       |         |       |          |           |           |       |          |
| come up<br>with |         |       |          |           |           |       |          |

*Using the received word combinations try to suppose whose responsibilities they are.*

Unit 4

## SOURCES OF INNOVATION

*“Problems worthy of attack  
prove their worth by fighting back.”*  
Paul Erdos (1913-1996)

There are two main sources of innovation. The traditionally recognized source is *manufacturer innovation* when a person or business innovates in order to sell the innovation. The other source of innovation, only now becoming widely recognized, is *end-user innovation*. In international trading end-user is the person, organization, or nation that will be the ultimate recipient of goods, especially such as arms or advanced technology. In this case, a person or company develops an innovation for their own (personal or in-house) use because existing products do not meet their needs.

Much attention now is given to formal research and development process for developing ‘breakthrough innovations’. However, they may also be matured by less formal on-the-job modifications of practice through exchange and



combination of professional experience and by many other routes. The more radical and revolutionary innovations tend to emerge from R&D departments while more incremental innovations may emerge from practice — but there are many exceptions to each of these trend.

***Speculate on the following questions:***

1. What do you understand by ‘breakthrough innovations’?
2. What is R&D? What are its functions?
3. What other routes of innovation developing can you name?
4. Do you think R&D is the only effective source of innovation?
5. Give examples of *manufacturer* and *end-user innovation*.

***Below are the definitions of the words often used when talking about innovation and inventions. Match the definitions with the terms. Give proper Russian equivalents of the terms.***

|                                                               |                                                                                                   |                                                                          |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| R & D<br>design<br>brainwave<br>absolute novelty<br>prototype | distinguishing capacity<br>human ingenuity<br>setback<br>competition<br>promotion<br>breakthrough | local novelty<br>patent<br>blueprint<br>marketing environment<br>project |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|

1. A detailed plan for a new product or business activity.
2. A detailed plan or scheme.
3. A model or initial version of something.
4. A sudden inspirational bright idea, also called *brainstorm*.
5. Competitors, the economic situation, and demographic, technological, political, cultural changes.
6. Informing customers about products and services and trying to persuade them to buy them.
7. Inventive talent and cleverness of people.
8. Opposite of *setback*, a success.
9. Rivalry between businesses in the same market.
10. Something new and original belonging to or connected with the particular place or area.
11. Something that hinders progress.
12. Something that is interesting because it is new, unusual, and has not been known before.
13. The art or process of deciding how something will look, work, etc. by drawing plans, making models, etc.
14. The department of a company that is responsible for developing new products.

15. The exclusive right given to an inventor to produce, or to authorize others to produce, a new product or process.
16. To be a distinctive and characteristic feature of something.

***The words below can be used to describe inventions or new ideas. Divide them into two parts according to their positive or negative meanings.***

|           |            |              |            |                 |
|-----------|------------|--------------|------------|-----------------|
| efficient | stale      | old          | useless    | fantastic       |
| pointless | daring     | uneconomical | marketable | ground-breaking |
| feasible  | viable     | impractical  | ingenious  | clever          |
| bright    | crazy      | fresh/novel  | ridiculous | revolutionary   |
| fixed     | farfetched | outmoded     | grandiose  | warmed-over     |
| absurd    | brilliant  | clear        | beneficial | main            |

### **Goals of innovation**

Organizational innovation is usually very closely linked to organization's goals and objectives, the business plan and the market competitive positioning. Companies cannot grow through cost reduction and reengineering alone. The depth of their technical expertise and the extent of their marketing skills are the crucial factors for succeeding and prosperity in groundbreaking activity. The desire of increasing bottom-line results enables them to develop the innovative concept far more effective than the innovators themselves. Proper approach to innovation is the key element in providing aggressive growth and intensification. In general, business organizations spend a significant amount of their turnover on innovation, i. e. making changes to their established products, processes and services. The investment is dependable upon industry and market positioning.

It is possible to rank in decreasing order of popularity systematic programs of organizational innovation. They are most frequently driven by:

- improved quality,
- extension of the product range,
- improved production process,
- reduced environmental damage,
- reduced energy consumption,
- creation of new markets,
- reduced labour cost,
- reduced materials,
- replacement of products or services,
- conformance to regulations.

These goals depend upon improvements to products, processes and services and dispel a popular myth that innovation deals mainly with new ideas development. Most of the goals could equally apply to any organization be it a manufacture, marketing firm, hospital or local government.

In order to complete the entire mentioned goals one should observe innovative strategy, which has its own mechanisms and regulations as well as the forces and relationships that tend to produce these recurrent movements. Ever since the Industrial Revolution at the end of the 18<sup>th</sup> century, technical

innovations have followed each other without end but not without pause. There have been periods of heavy growth of innovation and ‘cooling-off’ periods in which the innovations were being absorbed. Nevertheless, it is quite possible to suppose that exactly prior needs of the economy have dictated the necessity in technical innovations appearance and development.

Such cyclical movements may be explained by some factors that can cause them. First, although the economy has an inherent tendency to swing very widely there are limits beyond which it cannot go. The inevitability of time lags originated from the predictable delays between every decision and its effects provides another reason for expecting recurring fluctuations to occur in any economic process.

This obvious fact may be illustrated, for example, in the relation between the action of a thermostat and the temperature in the room. A fall in the room temperature causes the thermostat to turn on the heater; but there is a lag in time until the room warms up sufficiently to cause the thermostat to turn the heat off, whereupon the temperature begins to fall again. The shape of the curve of the temperature cycle will depend on the responsiveness of the thermostat and on the time required to raise the temperature of the room. By making various adjustments, it is possible to minimize the cycle, but it can never be eliminated.

In economic life, there are many such time lags: between the emergence of a new idea and the decision of grant; between the agreement to invest and the completion of the project; between the farmer’s choice to raise hogs and the arrival of pork chops to stores; between prices before innovation development and prices at the time the action is completed.

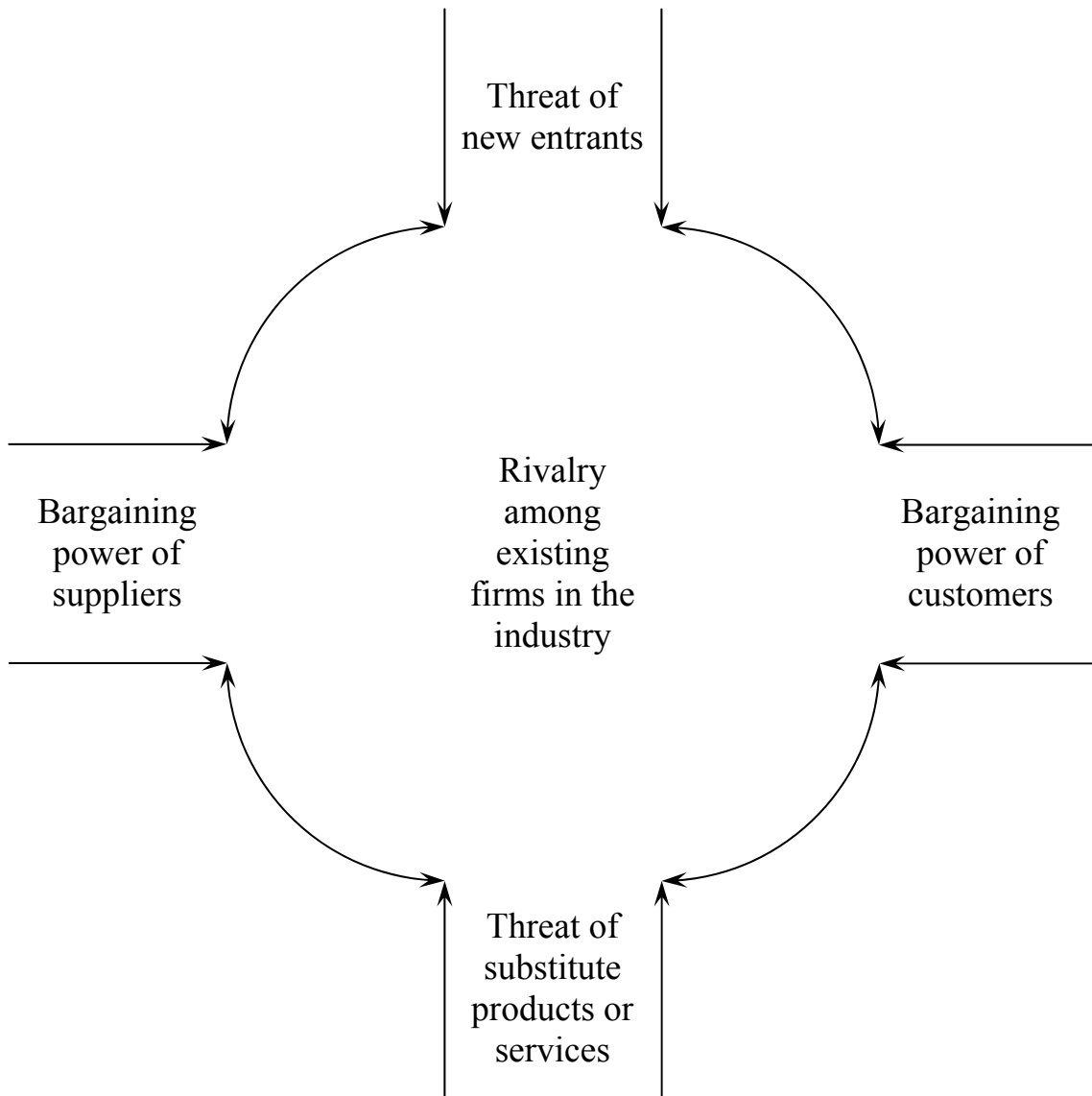
Random shocks, or what economists call exogenous factors, constitute the third type of phenomena affecting business cycles. These are such external disturbances to the economic system as unexpected weather changes, exciting discoveries, political agitation, global or civil wars, ecological catastrophes and so on. It is possible for such external impulses to cause cyclical uncoordinated movements within the system, in much the same way that striking a rocking horse with a stick will cause the horse to rock back and forth. The internal relationship of the given economic system determines the length of the cycle, while the external impulses govern its intensity.

***Give your opinion on the following questions:***

1. What do you think are the general goals of innovation?
2. What do you think are the main factors influencing the innovation goals?
3. Do you agree with a popular myth about innovation?
4. What other illustrations can you provide in order to explain the economic fluctuations?
5. Offer some other possible examples of time lags in economic life of this country.

6. What factors should be considered the main influencing economic phenomena?
7. Which factors — endogenous or exogenous — do you find the most influential in innovative process?

***Competitive strategy and advantage of any company may be given in the form of the following chart [4, p. 16]. Read and explain the main items of it.***



***The following questions may be of help to you in interpreting the chart.***

1. Why does the author of the chart insist on the threat of new entrants into the market?
2. Do you agree that both suppliers and customers can influence price policy? In what way do they influence it?
3. Why do you think rivalry exists among different firms in the market?
4. What threat do substitute products or services constitute to existing firms?

5. Do substitute products or services constitute any threat to suppliers or customers?

One of the most important elements of any manager's job is to motivate his or her subordinates to do their jobs well and to be productive and creative.

***Sentences 1 to 9 make up a short text about innovative strategy. Try to restore the logic of the text and correct the order of the sentences.***

1. However, another possibility for large companies with established products is to acquire small, newly successful, innovative firms, which they often find cheaper than innovating themselves.

2. However, it is well known that small, flexible companies produce far more innovations than big firms, proportionate to their R&D spending.

3. Innovative companies assume that all existing products, services, markets, distribution channels, technologies and processes are ageing and will have to be replaced as soon as they begin to decline.

4. Large companies often have rigid structures, and an emphasis on cutting costs and achieving economies of scale rather than innovating.

5. Of course, innovation requires experimentation, and inevitably leads to failures; indeed, around 90% of innovations do not succeed, so the other 10% have to cover the costs of the failures.

6. On the other hand, successful innovations can rapidly become profitable new markets or product lines or even give birth to entire new industries.

7. The business environment, which is to say, the world, is continuously changing.

8. Their logic is — we would not dream of getting into this industry today, so we should get out of it quickly, and re-allocate our resources to something new.

9. There is a constant evolution in the needs of customers, the technological skills of competing companies, patterns of international trade, and so on.

***In what way in your opinion is it possible to motivate your employees?***

***Do you think the manager should be creative and productive himself?***

***What requirements are necessary for motivation?***

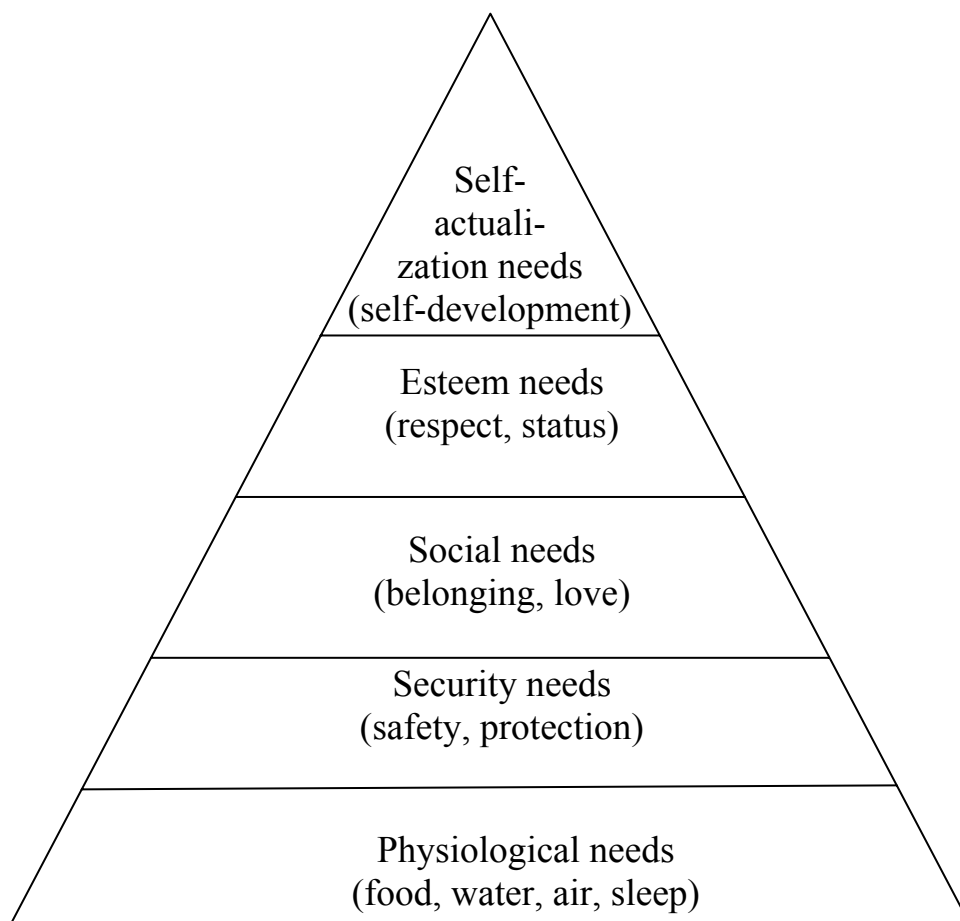
***What do you think motivate people in general?***

***Give you opinion on the following questions:***

1. Do you agree that the process of establishing oneself as a whole person, able to develop one's abilities and to understand oneself is a major requisite for motivation policy?

2. Do you think it is necessary to have great respect or high regard for one's innovations? Is it important to have an ability to judge one's new ideas?
3. What implies social needs? Can love and belonging influence one's motivation?
4. Do you agree that state of being secure should also accompany the motivation policy?
5. Why do you think it is necessary to speak on physiological needs in the theory of motivation?
6. Why in your opinion the scheme has the form of a triangle?

Two very well known theories of motivation among managers are those of Abraham Maslow<sup>1</sup> and Frederick Herzberg [4, p. 24].



***And now another test [2, p. 96-97] which shows whether you have some managerial abilities.***

***Just choose the appropriate for you answer and look through the table. Then make your score and see the result.***

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<sup>1</sup> U.S. psychologist and philosopher best known for his self-actualization theory of psychology.

## What is your IMQ (*Intuitive Management Quotient*)?

1. The founder and chairperson of your company have a new hobbyhorse that you think will be a disaster. Do you ...
  - a) *Try to talk him out of it?*
  - b) *Commission an independent consultancy report?*
  - c) *Go ahead on the basis he has been right most times before?*
  - d) *Resign?*
  
2. You meet a person you think would be an ideal member of your team, but you have no vacancy, headcount or budget for hiring him. Do you ...
  - a) *Create a new post for him?*
  - b) *Tell him to keep in touch until an opportunity arises?*
  - c) *Hire him and tell him to create his own role?*
  - d) *Offer him work as consultant?*
  
3. Your market research department produces a strongly negative report on a new product you are particularly enthusiastic about it. Do you ...
  - a) *Go ahead regardless?*
  - b) *Commission a second study from an outside agency?*
  - c) *Drop the product?*
  - d) *Seek to modify the product to meet the objections?*
  
4. Your subordinate wants to hire someone about whom you have “bad vibes”. Do you ...
  - a) *Tell your subordinate and let him decide?*
  - b) *Veto the appointment?*
  - c) *Keep quiet about it?*
  - d) *Get a psychologist’s report?*
  
5. You have a subordinate with a knack of being “right for the wrong reasons”. Do you ...
  - a) *Wait for his luck to run out?*
  - b) *Promote him?*
  - c) *Send him on a business management course?*
  - d) *Set up a subsidiary for him to run?*
  
6. You have a hunch, but not a shred of evidence, that one of your area managers is dishonest. Do you ...
  - a) *Ask Internal Audit to make an investigation of the area?*
  - b) *Switch him with another area manager?*
  - c) *Pull him into a head office job where you can keep a close eye on him?*

- d) *Engineer a redundancy/early retirement for him?*
7. The agency produces an ad that tests well and meets the brief, but you strongly dislike it. Do you ...
- a) *Fire the agency?*
  - b) *Veto the ad?*
  - c) *Let it go ahead?*
  - d) *Suggest some modifications to it?*
8. You are not a technical man, but have a hunch about the answer to a serious technical problem; your technical people think your hunch is nonsense. Do you ...
- a) *Leave it to them to follow their own line?*
  - b) *Insist that they pursue your in parallel?*
  - c) *Ask a contract research institute to examine your idea?*
  - d) *Set up some experiments yourself?*
9. The evening before you are due to commit to a major new investment project, your horoscope says “most unsuitable time for entering into new commitments”. Do you ...
- a) *Go ahead regardless?*
  - b) *Postpone the decision?*
  - c) *Drop the project?*
  - d) *Order a review of the project?*
10. You are due to fly to New York for an important meeting. Your wife has a vivid dream about plane crash. Do you ...
- a) *Postpone the meeting to another day?*
  - b) *Change the time so you can go by train?*
  - c) *Stick to the original plan?*
  - d) *Send your deputy?*
11. You have a mental picture of the potential shape of your business in five years’ time that is very appealing but radically different from where the existing strategy is taking the business. Do you ...
- a) *Dismiss it as a dream?*
  - b) *Set up a task force to review the present strategy and alternatives, including your vision?*
  - c) *Communicate your vision to the team and tell them to produce a strategy to make it happen?*
  - d) *Change the strategy piece by piece over time without revealing your vision?*



12. A questionnaire like this produces a very different result from your own self-image. Do you ...

- a) *Disregard the questionnaire?*
- b) *Check back over your answers?*
- c) *Examine the questionnaire's scoring system?*
- d) *Revise your self-image?*

***Check your score and see what it means.***

|     |        |        |        |       |
|-----|--------|--------|--------|-------|
| 1.  | a — 0; | b — 4; | c — 6; | d — 2 |
| 2.  | a — 6; | b — 2; | c — 0; | d — 4 |
| 3.  | a — 2; | b — 4; | c — 6; | d — 0 |
| 4.  | a — 4; | b — 0; | c — 2; | d — 6 |
| 5.  | a — 6; | b — 4; | c — 0; | d — 2 |
| 6.  | a — 6; | b — 2; | c — 0; | d — 4 |
| 7.  | a — 0; | b — 2; | c — 4; | d — 6 |
| 8.  | a — 0; | b — 4; | c — 2; | d — 6 |
| 9.  | a — 2; | b — 0; | c — 6; | d — 4 |
| 10. | a — 6; | b — 2; | c — 4; | d — 0 |
| 11. | a — 2; | b — 0; | c — 4; | d — 6 |
| 12. | a — 4; | b — 6; | c — 0; | d — 2 |

60+ You are certainly intuitive, maybe to the point of taking more risks than necessary.

45 — 59 You respect your intuitions, and temper them with reasonable prudence and concern for other's intuitions too. A nicely balanced, well integrated style — congratulations!

30 — 44 A safe middle-of-the-road position. You have not lost touch with your intuition, but you have it firmly under control.

Under 30 You are keeping your intuition under lock and key (if not under anaesthetic). If you do not exercise it a bit more, you will lose touch with it altogether.

***Do you think intuition is necessary in life? In business? In any possible situation?***

***Do you consider yourself an intuitive person? Did your intuition ever help you in life? Give some examples.***

***Do you think it is possible to develop one's intuition or it is a native gift?***

***What do you prefer to follow in some difficult life situations — arguments and facts or your intuition?***

## CULTURAL STEREOTYPES AND INNOVATION MANAGEMENT

*“Not everything that can be counted counts,  
and not everything that counts can be counted.”*

Albert Einstein (1879-1955)

You have probably heard jokes like this British one:

*What is the difference between heaven and hell? In heaven, the French are the cooks, the Germans are the engineers, the British are the politicians, the Swiss are the managers, and the Italians are the lovers. In hell, the British are the cooks, the French are the managers, the Italians are the engineers, the Germans are the politicians, and the Swiss are the lovers.*

***Speculate on the following questions:***

1. What do you understand by ‘stereotypes’?
2. Do you agree that every nation has its own stereotypes?
3. Is there any truth in national stereotypes?
4. Is it possible to judge on the nation according to its stereotypes?
5. What do you think are the reasons for such stereotypes? What forms them?
6. Do you find such stereotypes amusing or offensive?
7. Can cultural habits have an effect on business practices and management styles?

***Match up the following adjectives into pairs of opposites. What descriptions could you apply, in general, to the people in your country, or to those of foreign countries?***

|               |                 |              |                 |
|---------------|-----------------|--------------|-----------------|
| Arrogant      | Chaotic         | Hard-working | Devious         |
| Generous      | Hospitable      | Noisy        | Tolerant        |
| Lazy          | Lively          | Mean         | Modest          |
| Narrow-minded | Individualistic | Progressive  | Public-spirited |
| Quiet         | Relaxed         | Reserved     | Serious         |
| Conservative  | Trustworthy     | Unfriendly   | Well-organized  |

***Which countries or parts of the world do you think the following below descriptions might apply to? Do stereotypes help or hinder business relationships?***

1. Phone communication is very common and accepted for them. They frequently conduct business meetings on phones. Sometimes people work together for months or even years before ever meeting.

2. Their home is a private place where only close friends or family are invited. Business colleagues usually socialize in restaurants or other public places.

3. They accord status and respect to older people, and promotion comes with age.

4. They are collectivist, so they dislike the idea of one person in a group earning much more than his or her colleagues.

5. They are efficient, punctual, and highly organized.

6. They are great believers in analysis, rationality, logic and systems.

7. They are individualistic, so paying people according to their performance is highly successful.

8. They are said to belong to a generally polychromic culture. Polychromic people are used to do several tasks at the same time.

9. They are said to belong to a monochromic culture.

10. They are very keen to find a consensus and to avoid confrontations.

11. They are very short-term oriented, thinking only of quarterly results.

12. They believe that personal relationships and friendships are more important than rules and formal procedures.

13. They believe that rules are very important, and exceptions should not be made for friends.

14. They place great stress on personal relations, intuition, emotion, feeling and sensitivity.

15. They put great importance on formality and social skills. The sex of the negotiator is not very important but the age of him is of extreme significance.

16. They seem to be much disorganized, but on the other hand, they get their business done.

17. They spend much time to develop strong and stable business relationships and to plan a good partnership.

***Do you think it is possible to connect well-known national stereotypes with the world of innovation? What human qualities might help people invent anything?***

The most exciting issue in modern business contacts now is cross-cultural communication. It means an adequate mutual understanding between two or more participants of an act of communication belonging to different national cultures. The cultural context may be manifested in a variety of forms: from the commonly used formulas of greetings to the so-called broader context — the history of a country's traditions and business ethics.

In order to make the only right decision one should often combine deep knowledge, clear logic and sometimes intuition.

*Read through the following test [2, p. 96-97] choosing the most appropriate action of yours for every given imaginary situation. In each case, you can either agree to the suggested action, or refuse. After you have chosen, look at the paragraph indicated on the next page.*

### **Business Ethics**

1. Everybody expects the government to change at the next election. The Chairman suggests that all the members of the board should start “wining and dining” politicians to form the next government — i. e. inviting them for expensive restaurant meals, in order to explain to them the company’s situation and problems.

*Agree > k                      Refuse > f*

2. Someone suggests that the easiest way to find out what competitors are doing is secretly to pay one of their staff to take pictures of their production processes.

*Agree > d                      Refuse > h*

3. The manager of a foreign subsidiary explains that to get quick planning permission to build a new factory it is necessary to give a few cash ‘presents’ to local officials. \$10,000 will save a year of bureaucratic difficulties.

*Agree > g                      Refuse > r*

4. Whenever there is a north wind, foul-smelling sulphur dioxide emissions from one of your factories pollute a nearby town. The local authorities ask you to fit filters on your chimneys, but this will cost at least \$300, 000, the equivalent of six months’ profit.

*Agree > c                      Refuse > n*

5. You could save 15% of your production costs by closing a factory in a small town where you are a major employer, and relocating to a cheaper developing country. This would result in 1500 people losing their jobs in one town, and 1200 jobs being created in another.

*Agree > e                      Refuse > p*

6. You discover that one of your suppliers in a developing country employs children as young as nine years old in its factory, in appalling working conditions. They say that if you cancel your orders they will have to close the factory and the whole village will lose this major source of income.

*Agree > m                      Refuse > a*

7. Your products are now of such high quality that they last for at least ten years, and your sales are consequently lower than they used to be when your products were less durable. Someone suggests using cheaper components that will not last quite so long.

*Agree > l                      Refuse > q*

8. You have produced a huge quantity of toys under an exclusive contract to tie in with a major new Hollywood movie. However, just before the film is

released, you discover that prices of the toy can be broken off and that young children swallow them and even choke to death.

*Agree > b*                      *Refuse > j*

9. Your major competitor is about to manufacture a product using a revolutionary new production process. Someone suggests advertising for a Productive Manager, even though the job is not available, hoping your competitor's staff might apply, and give you some useful information in an interview.

*Agree > o*                      *Refuse > l*

***Here are the comments upon the situations given. Make your score. You will have scored somewhere between +12 and – 25 points.***

a. Are you familiar with the concept of “ethics”?

**Lose 3 points.**

b. Are you joking? Murderer?

**Lose 5 points.**

c. Congratulations, on your ecologically sound decision. Unfortunately, the shareholders are unhappy and start selling their shares, whose price drops 15%!

**Lose 1 point.**

d. Industrial espionage is unethical and illegal and is for losers.

**Lose 3 points.**

e. In the long run, you have to reduce costs to remain competitive. This is probably the right decision, but you do not really expect any points for making 1500 people jobless, do you?

f. Lobbying politicians on this scale is perfectly legal. Your refusal could be damaging for the company.

**Lose 2 points.**

g. Paying someone to ensure a necessary service is not the same as bribing companies or politicians to win contracts, and is sometimes necessary. But you'll have to think of something else to put in the accounts than “Bribes: \$10,000”!

**Score 1 point.**

h. Quite right. You would be encouraging someone to break the law.

**Score 2 points.**

i. Selling products with built-in obsolescence is not only ethically dubious, but is also a shortsighted move if your competitors retain a reputation for durability and quality.

**Lose 3 points.**

j. This is a very costly decision, but the only one possible.

**Score 4 points.**

k. This is called lobbying. Most large companies do it.

**Score 1 point.**

l. This is not illegal, and if your competitors' employees give away secrets, they are guilty, not you. Besides, your competitor could make them sign contracts forbidding them to work for you within a year of leaving their company.

**Lose 1 point.**

m. This is the right decision. It is your suppliers' responsibility to ensure that his business continues, by not employing children in his factories.

**Score 1 point.**

n. What is six months' profit compared with your local community's health and quality of life?

**Lose 3 points.**

o. Why not? Nobody is forcing anyone to apply for the job or to be indiscreet.

**Score 1 point.**

p. You are ensuring that your company will become uncompetitive.

**Lose 1 point.**

q. You are right to refuse, for long-term marketing reasons as well as ethical ones.

**Score 2 points.**

r. You have cost your company thousands of dollars by refusing to comply with a local custom.

**Lose 3 points.**

***Read through the joke at the beginning of this Unit again. Name some inventions linked with Germany. What outstanding Italian engineers and designers do you know?***

*Here are some interesting inventions made by Germans. Do you know their names?*

- A Bunsen burner is a flame-making device that combines a flammable gas with air, named after **Robert Bunsen**, the German chemist who introduced it in 1855. He did not really invent the burner; he took the design from Peter Desdega or Michael Faraday. Bunsen was the real inventor of the carbon-zinc electric cell (1841), the grease-spot photometer (1844), the filter pump (1868), the ice calorimeter (1870) and the vapour calorimeter (1887).
- On January 29, 1886, **Karl Benz** received the first patent for a crude gas-fueled car.
- In 1887, a German physicist named **Heinrich Hertz** began experimenting with radio waves in his laboratory in Germany. He found that radio waves could be transmitted through different materials and some materials reflected the radio waves. His experiments were the foundation for the development of radio communication and radar.
- The name ‘taxicab’ — usually abbreviated to taxi — derives from the taximeter, the instrument which measures the distance travelled — or time taken — thus allowing an accurate fare to be determined. The German inventor, **Wilhelm Bruhn** in 1891, invented this device.
- Gummy candy comes from Germany. The owner of the German candy company *Haribo*, **Hans Riegel** invented gummy bears in the 1920s. *Haribo* started making the first gummy candy in the United States in 1982. The candy manufacturer Trolli decided to make the first gummy worm in 1981, now the most popular gummy ever. The average *Bright Crawler* is two inches long.
- High Fidelity recording, which Hi-Fi is short for, began in Germany during the war. The *Reichs-Rundfunk-Gesellschaft* (German Radio) had made experimental stereo FM music broadcasts in Berlin in 1941, using a custom version of the high-fidelity *AC-bias Magnetophon*, a German tape recorder made by AEG (German GE.) We can say that the inventors of High Fidelity were AEG engineers, **Weber** and **Von Braunmuhl**.
- The first ballistic missile was the V-2 missile. It was developed by scientists led by **Wernher von Braun** in Germany starting in 1936. The first successful launch was October 3, 1942. The V-2 was fired against Paris on September 6, 1944.
- The German Baron **Karl Drais von Sauerbronn** invented the “*Laufmaschine*” or “*Running Machine*”, a type of pre-bicycle. The

*Laufmaschine* was made entirely of wood and had no pedals; a rider would push his/her feet against the ground to make the machine go forward.

- **Adolf Miethe** and **Johannes Gaedicke** invented *Blitzlichtpulver* or flashlight powder in Germany in 1887.

*Some more information about inventions for you. Do you know that?*

- In 1849, the Bourdon tube pressure gauge was patented in France, by **Eugene Bourdon**? It remains one of the most widely used instruments for measuring the pressure of liquids and gases. Bourdon also founded the *Bourdon Sedeme Company* to manufacture his invention. Edward Ashcroft purchased the American patent rights in 1852. He renamed it the Ashcroft gauge.
- In 1806, carbon paper was invented by **Pellegrino Turri** of Italy.
- The barometer was invented by **Evangelista Torricelli** in 1643.
- The six-stroke engine, the black box recorder (airplane), the pacemaker, the torpedo, differential gears, sound-proof windows, the periscope rifle, the superefficient solar cell and more are all Australian inventions?

*Do you agree that Germans possess engineering attitude of mind?*

*Why in your opinion is the Russian nation absent in the joke given at the beginning of the Unit?*

Unit 6

## FAILURE OF INNOVATION

*“The opposite of a correct statement is a false statement. The opposite of a profound truth may well be another profound truth.”*

Niels Bohr (1885-1962)

Attaining concrete marketing and managerial goals must be the ultimate objective of the innovation process. Unfortunately, most innovation fails to meet organizational goals.

Innovations that not succeed are often potentially “good” and positive ideas but they can be rejected or “shelved” because of some budgetary limitations, lack of marketing and executive skills or poor fit for use. Failure should be identified and uncovered in the innovation process as early as possible. Early screening allows avoiding unsuitable consequences,



economizing scarce resources and progressing ones that are more advantageous. Organizations can learn how to keep away from feasible failure through open discussions and debates with all the participants of the inventive activity. The lessons learned from failure often reside much longer in the organizational consciousness than lessons learned from quick commercial success.

The scholars have thoroughly researched causes of failure, which vary considerably. The most obvious cause relates to the cultural managerial infrastructure. In spite of the fact that the conceptual framework is common in different organizations, their cultural environment may often vary considerably. Nevertheless, one can find several regular shortcomings at dissimilar stages in their life cycle. Inadequate leadership, scanty organization, lack of communication, insufficient empowerment, and low knowledge management are main reasons to experience failure.

Prevalent causes of failure within the innovation process itself in most organizations are generally broken up into five types: fuzzy goal definition, uncoordinated alignment of actions to goals, inefficient participation in teams, defective monitoring of results as well as deficient communication flow and access to information.

From this point of view, innovation succeeds due to acceptable managerial strategy that involves the individual for the organization's benefit. Innovation rests upon essentially motivated and completely informed individuals whatever their position is, within a supportive corporate culture, screening the situation from a new perspective.

Innovation implies change and is by no means connected with an organization's orthodoxy. Space for fair consideration of innovative ideas is required to balance the potential retrograde approach that usually resists an infant innovative culture.

***Give your opinion on the following questions:***

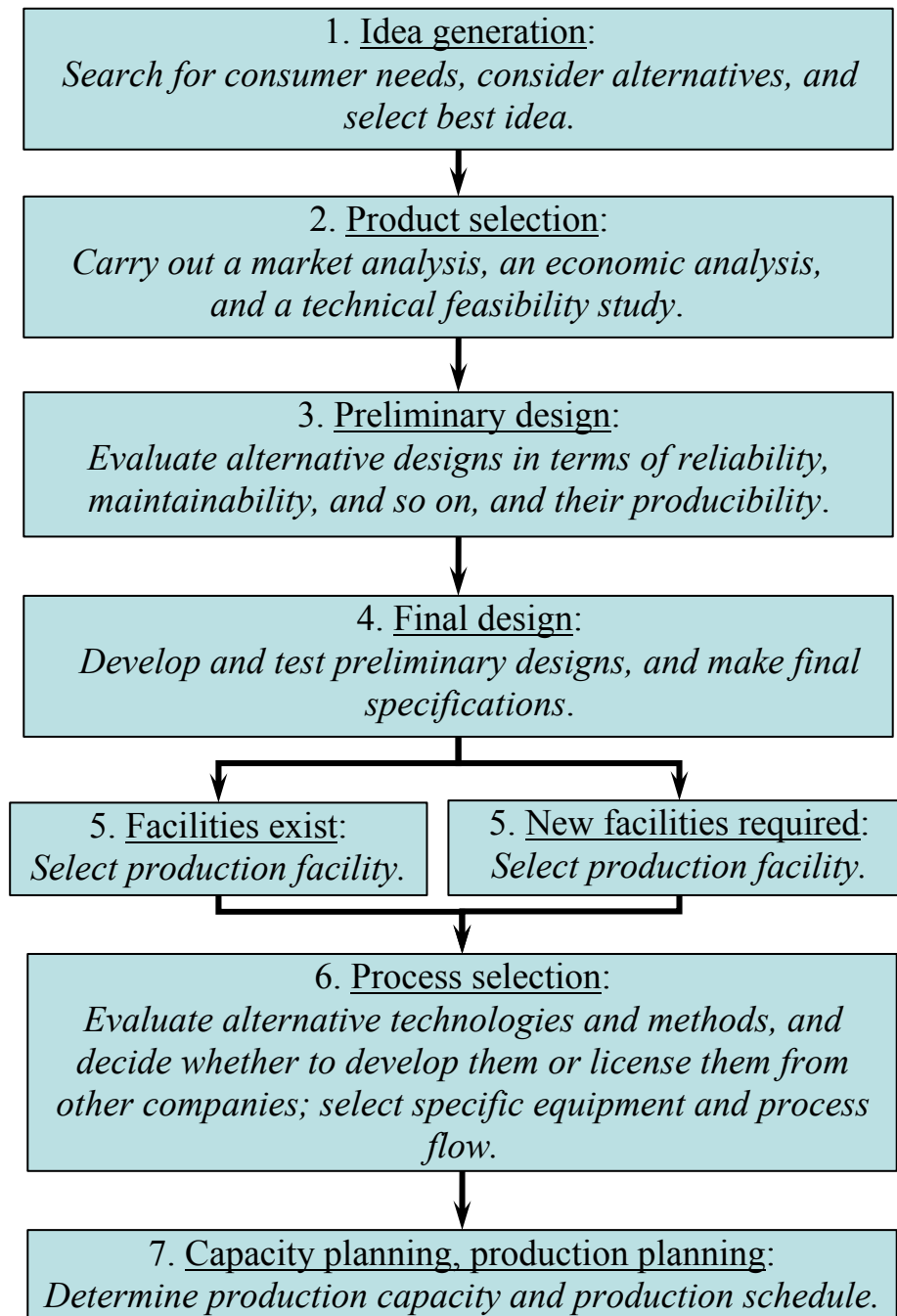
1. Give your comments upon the quotation to the Unit.
2. What do you understand by 'organizational culture'?
3. What in your opinion are 'organizational goals'?
4. Why do you think most innovations fail because of the organizational goals?
5. How can you clarify the notion 'conceptual framework'? Why is it common in different organizations?
6. What do you consider the most important reason for innovation failure?
7. Is it possible to avoid innovation failure?
8. What do you think is more instructive — a success or a failure?
9. What mechanisms is it possible to propose to avoid innovation failure?

Most innovations mostly concern the development and promotion of new products. In order to create something new one should have a definite idea about

proper requirements for it on the market. It implies a sequence of several regulated actions and steps for a new product to appear.

*Below you can see a chart [4, p. 50] showing the standard Product Design and Development stages, which you are to interpret.*

### Product Design and Development



*There are some questions for you to share your opinion, explain the mentioned terms and comment upon the chart given above.*

1. Why do you think new ideas are generated?

2. Can one just trust the intuition of senior managers or product managers to develop a new product?
3. What methods of idea generation process can you offer?
4. What consumer needs should you search for?
5. What do you understand by 'best idea'? Does it mean who proposed it?
6. Do you think there should be special criteria for selection?
7. Why is it necessary first to select a product for its creation?
8. What alternatives should be investigated and why?
9. What do you understand by 'market analysis'? 'Economic analysis'?
10. What do you think 'market research' means?
11. Do you think it is necessary to work out different questionnaires for customs?
12. What implies 'technical feasibility study'?
13. Should you consult some literature about alternative designs? Why?
14. What main characteristics of the products should be taken into account?
15. What for is it necessary to test preliminary designs?
16. What should be final specifications of a new product?
17. What technical problems may occur at one of the stages?
18. Do you think that only new production facilities are necessary for developing new products?
19. Why do you think it is important to determine production capacity and production schedule?
20. What in your opinion is simpler: to develop new technologies and methods or licensing them from other companies?
21. Why is it necessary to strictly determine production capacity and production schedule?
22. Who do you think play the main role in selection process: inventors, producers or customers?

### **Historical background of patents**

We have already mentioned that being first in the innovative field is not always primary as the business world is sometimes rather unfair and cruel to pioneers. In order to protect one's innovation and introduce any invention one should take some measures to patent it.

Patent is a government grant of the exclusive right to make, use, or sell an invention, usually for a limited period. Patents are granted to new and useful machines, manufactured products, and industrial processes as well as to significant improvements of existing ones. Patents are also granted to new chemical compounds, foods, and medicinal products, likewise to the processes for producing them. Patents can even be granted to new plant or animal forms developed through genetic engineering.

The first recorded patent for an industrial invention is the one granted in **1421** in Florence to the architect and engineer **Filippo Brunelleschi**. The patent

gave him a three-year monopoly on the manufacture of a barge with hoisting gear used to transport marble.

It appears that such privileged grants to inventors spread from Italy to other European nations over the next two centuries. In many cases such grants dealt with the importation and establishment of new industries, as in England at the time of Queen Elizabeth I. It soon became apparent that unlimited duration of exclusive rights created unfair monopolies, and in 1623 Parliament enacted the *Statute of Monopolies*. Although it prohibited most royal monopolies, it specifically reserved the right to grant ‘letters patent’ for inventions of new manufactures for up to 14 years. In the United States, Article I, Section 8 of the *Constitution* authorizes Congress to create a national patent system to “promote the Progress of Science and useful Arts” by “securing for limited Times to ... Inventors the exclusive Right to their respective ... Discoveries.” Congress passed the first *U.S. Patent Statute* in 1790. France enacted its patent system the following year. By the end of the 19<sup>th</sup> century, many countries had patent laws, and today there exist approximately 100 separate jurisdictions regarding patents.

A patent is recognized as a species of property and has the attributes of personal property. It may be sold (assigned) to others or mortgaged or may pass to the heirs of a deceased inventor. Because the patent gives the owner the right to exclude others from making, using, or selling the invention, he or she may authorize others to do any of these things by a license and receive royalties or other compensation for the privilege. If any persons make use of a patented invention without authorization, their infringement can be brought to court in a suit filed by the patent holder, who may ask for an amount of money in damages as well as a court injunction to prevent further infringement.

The duration of patents varies, ranging from 16 to 20 years in most countries. In some countries, like France, certain types of patents are given shorter terms because the inventions have an overall general usefulness. After the patent term expires, the invention is open to public use. In socialist countries such as the former Soviet Union, where property was treated differently, patents *per se* were not recognized. Instead, certificates were issued to inventors to ensure that they received some form of compensation for their work. This system, however, served only for a time. For example, China, which modeled its earlier patent system on that of the Soviet Union, enacted a wholly revised patent law in 1985. In many respects, it mirrors the patent law of European countries, with the exception that enterprises rather than individuals are the usual grantees of Chinese patent rights.

By the way, do you know that **Abraham Lincoln** also held a patent? He invented a way to keep large boats afloat.

***Give your opinion on the following questions:***

1. What is a patent?
2. What for do you need a patent?
3. How long is the history of patent giving?

4. What was the first country granting recorded patent?
5. What was the first recorded grant given to F. Brunelleschi for?
6. What is Brunelleschi's nationality?
7. Why is a patent considered as a personal property?
8. What rights are given to a patent holder by this grant?
9. What do you think about the duration of patents? Do you think it should be shortened?
10. Are there laws in your country forbidding the cloning — making exact genetic copies — of humans?
11. Can you see any dangers in the 'ownership' of scientific knowledge? If a scientific team makes a new medical breakthrough, should they be able to keep it to themselves until the price is right and profit from it?

Below you can see some very specific technological innovations [5], which are the results of ever thinking human brains. The very attentive human eyes watching his surroundings make the brainwork rather hard and invent, invent, invent... People create things for themselves, their relatives, their pets. Once starting inventing people cannot stop doing it. Moreover, you may make sure yourself there is no limit to human imagination.



We get into the way of taking an umbrella with us in a rainy day. What do we want to protect? Our head and hair or our clothes or may be our footwear? If it is a thunderstorm, we prefer to stay at home since we are not eager to get soaked to the skin. The fact that one's footwear as a rule is not rainproof

awakes an inventor's dormant talent. If there are umbrellas covering one's head why not to try to invent a special device for one's shoes? Can you just assume yourself in shoes with these little umbrellas? Of course, they are best for rains, as it will save one's expensive footwear from damage. However, it is easy to imagine the attitude of surroundings towards a person wearing such shoes. If one wants to save his dress from rains then the umbrella with cellophane sheet will also be the best.

Next picture shows a tissue paper roll over your head, which will help you easily wipe your nose when you suffer from cold. One cannot agree with the originality of such a gadget. Would you like to try it on? Just imagine yourself with such a device at lectures or examinations! What the reaction of surroundings will be, who knows?





**Dominic Wilbox** was inspired for creation of a unique bed. Everybody



knows how important for one's health a sound sleep is. That is why inventors pay much attention to the problem of people's rest. This inventor used his own body as a pattern to design his abnormal and extraordinary bed. If you find the idea of falling off the bed from a deep sleep and doing it repeatedly all the night attractive, you can surely go for one. Don't you think this weird bed deserves to be exhibited in a museum for weird creations?

In addition, have a look at one more amazing and peculiar invention. A wedding ceremony is rather exciting as it is an old tradition and the bride desires to be the most beautiful and stand out of the crowd. The wedding dress patterns have captured human minds for a long time. The designers have tried their best to create something exclusive. Nevertheless, the inventiveness crossed the heights when **Valentyn Shtefano** proposed his personal design of a bride's dress for this solemn occasion. As his name is widely known in the field of baking as visual art, Shtefano made a wedding dress from flour, eggs, sugar and caramel for a bride named Viktoriya.

The inimitable dress was made from 1,500 cream puffs and weighed 20 pounds. It took Valentyn Shtefano two long months to complete the dress. Viktoriya said that she felt a little embarrassed in the beginning but after a few hours, she did not even think of taking it off.

It goes without saying that she looked very extraordinary and attractive in such an edible costume! Both she and her husband will remember this day all their life.

Well, who knows? If you were suggested to wear a dress of eggs, cream puffs and flour on your wedding day, would you really do that?



*Please do not smile but try to appreciate these matchless gadgets for people. Think over them. What is your opinion of these creations?*

*Can you state that all these inventions are failures?*

*Do you agree that all above-mentioned gadgets deserve to be placed in museums?*

Thomas Alva Edison once said, “I can never pick up a thing without wishing to improve it”.

*Imagine yourself an idea generator. What thing would you like to improve or modify and in what way?*

Unit 7

## INVENTIONS AND THE MARKET

*“Restlessness and discontent  
are the necessities of progress.”*

Thomas Edison (1847-1931)

*Speculate on the following pre-reading questions:*

1. Do you think it is better to innovate or imitate products and services?
2. What are main steps for products and services innovation?
3. What are the general stages of products and services imitation?
4. What do you think is more difficult — to create a new thing or to properly imitate it?
5. What products do you think people prefer — original or imitated ones?
6. Why in your opinion is market open for imitated products?
7. What do you think the relations between inventors and producers are in this case?
8. Does any competition between inventors and producers exist on the market?
9. Whose names in your opinion should people remember after years?
10. Do you think market environment is always fair and friendly to innovators?
11. Do you know any companies in your country or abroad, which were a) innovators? b) imitators? Name some of them.

### **Why the last shall be first?** [6, p. 56]

Have you heard of *Berkey* or *Ampex*? *Gablinger* or *Chux*? Perhaps you should have, because each occupies an important place in the history of product innovation. *Berkey* produced the first hand-held electronic calculators, *Ampex*

the first video recorders. *Gablinger* developed low-alcohol lager and *Chux* sold the first disposable nappies.

Alternatively, perhaps you should not, because none of these companies made a commercial success of their innovations. Today *Casio* probably makes the calculators we use, our video recorder comes from Matsushita, our low-alcohol beer is *Miller Lite*, and *Proctor & Gamble* make our nappies. In each of these markets, the innovator was swept away.

*Xerox* looks like an exception to this sorry catalogue. The company was first into the photocopier market and, even if its dominance was ultimately challenged by *Canon*, it remains a large and successful company today. However, *Xerox* was also a pioneer in fax machines and personal computers. Each of these eventually proved to be a success — but not for *Xerox Corporation*.

As we all know, it was *Apple* that developed the personal computer market. Nevertheless, *Apple's* leadership quickly disappeared when IBM came on the scene. *Apple* then jumped ahead by introducing the graphical user interface. Its windows and mice brought personal computing within the reach of everyone. However, it is *Microsoft* that does this now.

The business world is not kind to pioneers. Even if you know how a market will develop, timing is a matter of luck — or of quite exceptional skill.

There are two closely related lessons. One is that being first is not often very important. The other is that innovation is rarely a source of competitive advantage on its own. Individuals and small companies can make a great deal of money out of good new ideas. The success of large established corporations — *Matsushita*, *Philip Morris*, *IBM* or *General Electric* is generally based on other things: their depth of technical expertise, their marketing skills. Moreover, repeatedly these characteristics enable them to develop the innovative concept far more effectively than the innovators themselves.

This is not to say that there is no role in business for the great innovator. After all, *General Electric* was built on the extraordinary creativity of Thomas Edison's mind, the Ford motor company on the abilities of its eponymous founder. The imagination of Walt Disney created a company that is still without parallel or rival. Perhaps Akio Morita of *Sony* occupies a similar place in the annals of modern business.

***Share your opinion on the after-text questions:***

1. Comment upon the given title of the article.
2. Several well-known companies are mentioned in this article. What are the main reasons for their success?
3. In what way do you think well-known companies *Disney*, *Ford*, *General Electric* and *Sony* are connected together?
4. Why do you think such a severe competition exists on the market between well-know companies?



5. Do you agree that market is always friendly to innovators?

***Correct the following statements using the right facts from the article and give your comments upon them:***

1. *Ampex* and *Berkey* are the two well-known companies in the history of product imitation.
2. *Apple* deals mostly with fax machines.
3. *Canon* was a pioneer in fax machine and personal computers producing.
4. *Canon* was also the first to come into the photocopier market.
5. Every innovation is nothing but an origin of differential advantage.
6. IBM came into our life due to *Microsoft Company*.
7. It is very significant to be a pioneer in the market.
8. It was *Microsoft Company* that developed the personal computer market.
9. Nothing can develop the innovative concept better and more efficaciously than the innovators themselves.
10. Nowadays all people still remember the names of the inventors of common things they use such as calculators or nappies or low-alcohol beer.
11. One can never rely upon timing in market developing, as it does not play any role in business world.
12. Only hard work can create something extraordinary.
13. Only huge companies can turn large profit out of good new ideas.
14. Producers play the most important role in modern business.
15. The success of any big company depends on its ability to earn large profits.

***Give your comments on the following statement of Thomas Edison — “Invention is 1% inspiration and 99% perspiration”. Do you agree with it?***

### **Presentation and its techniques**

A presentation is the act of showing something, especially a new product or idea, or piece of work, to a target group of people. The main objective of a presentation is to introduce a new product or service and to persuade public to purchase it. It is also possible to submit new ideas for approval and their further development giving background information. An effective presentation with slides and illustrations is always the decisive factor that sells an idea or product. In order not to bring a presentation to a disaster it should be thoroughly prepared in advance as fluent speech and the seemingly simple and easy-going manner of presenting are the result of grunt work and ‘bathroom rehearsal’.

Every effective presentation should rely upon three significant elements of it. The first constituent concerns the relevant information, which should be properly and logically organized. The second component implies the impressive information delivery. It means that one should give it to the people concerned, in the intelligible form and at the most suitable time. The third of fundamentals

deals with the use of the language (proper communicative style, speech clichés and conversational formulae). There are several forms of presentation such as aural, audiovisual, electronic and multimedia ones.

A presentation has a strictly outlined logical structure and is divided into several sections. It starts with opening when one introduces himself, says what the presentation is about, explains the arrangement of the talk, indicates his policy on questions. Then main section comes. The speaker gives all the facts, involves the audience as appropriate, makes use of any visuals and clearly marks changes of topic. The last element is conclusion where the speaker gives a summary, invites questions and thanks the audience.

The first stage of the presentation is when the speaker should get the full attention of the audience. Knowing the subject of the presentation is the second essential point. However, the primary consideration of a speaker is awareness of his audience, i. e. its interests, cultural and financial background, life style and living standards. Moreover, when preparing a presentation try to find out what the audience already knows.

Finally, last but not the least is the image of the speaker. It is of great importance whether he looks and sounds formal, informal, relaxed or high-powered. His personal style, dress code and body language affect the presentation at a great extent.

Remember that badly handled presentation can ruin weeks of careful preparation, turn off a previously keen customer or relegate forever a good idea.

Understand the ten commandments of effective presenting. They are as follows:

- Speak up.
- Get to the point early.
- Gesture naturally.
- Vary your volume, pitch, and tone.
- Organize your speech.
- Use direct eye contact.
- Pause effectively.
- Speak at a comfortable pace.
- Use appropriate visual aids.
- Listen to what your audience is telling you verbally and nonverbally.

***Now some questions for you to dwell upon them:***

1. Explain the notion ‘presentation’ and its main goals.
2. What do you understand by target audience?
3. What do you identify with ‘right people, right form, and right time’?
4. Do you think product and innovation presentations differ greatly?
5. What are the crucial factors for a successful presentation?

6. Why do you think it is absolutely necessary to divide a presentation into sections?
7. Which part of presentation in your opinion is of more importance?

A business presentation should grab attention from the start. Along with a personal introduction and greeting, a business presenter often uses a personal story, a riveting visual aid, an interesting fact, a joke, or a relevant anecdote to catch attention and build rapport.

From that point on, the nature of topics treated and the method of topic development will depend largely on the speaker's analysis of his or her audience. From that analysis emerges a pattern of organization that will make the speech 'hang together' (that is, be clear at all major points) for the audience. Common patterns of organization include the following.

The Problem-Solution Presentation should have five main parts such as Introduction, Description/Analysis of the problem, Review of attempted solutions from the past, Evaluation of what is needed now, and Recommendation for action.

The Information Presentation should contain Introduction, a part describing what we already know and why, a piece analyzing what we need to know and why, Presentation of needed information, and Conclusion with recommendations.

The Interpretive Presentation should consist of Introduction, a part describing the present situation, a division explaining how it came about, an element supposing what we can do about it and Conclusion with recommendations.

Conclude the business presentation with a summary statement that answers the question, "So what?" (that is, so what if all you have said in the presentation is true? What does it add up to?). In many cases, the answer to the "so what?" question is a call to action, in which the presenter urges the audience to take a defined course of action.

***Comment on the following statements. In your opinion, are they: a) essential, b) helpful, c) unhelpful for a successful presentation?***

1. Do not read an oral presentation.
2. Tell a joke at the beginning.
3. Speak more slowly than you normally do.
4. Make eye contact with audience.
5. Smile a lot.
6. Visual aids make presentation easier.
7. Involve the audience.
8. Always keep to your plan.
9. Move around during the presentation.
10. Conquer fear of making grammatical errors.

11. Invite questions during the presentation.
12. Use many gestures to emphasize important points.
13. Read out your presentation from a script.
14. Develop your summarizing and outlining skills.
15. Use note cards during presentation.
16. Stand up when giving your presentation.
17. Never laugh at your own jokes.

***Think about your weak and strong points as a speaker in public.***

***Give sincere answers to this questionnaire [2, p. 48-50].***

### **Presentation techniques**

1. When you give a presentation you wear
  - *a well-pressed suit or costume.*
  - *whatever you feel comfy and self-assured in.*
  - *whatever is in harmony with the occasion and the audience.*
2. When you give your contribution at a meeting, do you
  - *speak on the spur of the moment.*
  - *as in a) but first make notes.*
  - *Prepare for it well in advance and rehearse it in the bath.*
3. Are you a speaker who
  - *mumbles under your breath.*
  - *talks with ease.*
  - *steals the show with your charm.*
  - *makes your audience roll in the aisle with your jokes.*
4. Your style of speech is
  - *analytical/rational.*
  - *emotional/theatrical.*
  - *descriptive/factual.*
5. When you give a presentation, do you
  - *use body language.*
  - *keep eye contact with one person.*
  - *make it a point to shift your eye contact.*
  - *smile from time to time.*
  - *use a variety of gestures.*
  - *keep fingering your spectacles.*
  - *read your talk.*

- *talk to your notes, the blackboard or your visual aids.*
- *stand with your back to a wall or curtain to minimize distractions.*
- *keep visual aids covered until you need them.*
- *walk up and down, fidget and use the same gesture all the time.*
- *overrun your time.*
- *finish before you are expected to.*
- *stand in front of a window.*
- *compete with yourself or other distractions.*
- *if you distribute something to be looked at, stop talking till everyone has examined it.*
  - *lean forward facing the audience.*
  - *start by summarizing what you are going to say, then say it, and end by summarizing it again.*
    - *laugh at your own jokes.*
    - *smoke.*

***Try to analyse this list of good and poor advice and criticize yourself.***

***What important tips you have now mastered?***

***What would you like to improve in your speaking style?***

***Make a list of Dos for an effective and striking presentation.***

Here are some key phrases from a presentation at a conference called “*The way we will be living in 2027*”.

***Number them in the logical order that they were probably used. If you think there is more than one possibility, explain why.***

1. I am going to talk about three main areas: communication between people, business-to-business commerce, and the social effects of the Internet, with a look at how we might be using it in the year 2027.
2. I will talk for about 45 minutes and then we will have 15 minutes for questions.
3. If you could keep your questions until then, we will have a chance to go into them more deeply.
4. If you have any questions, I will be delighted to answer them now.
5. My name’s Maria Robles and it is an honour to have been invited to this conference as a keynote speaker.
6. Nevertheless, I am sure in one thing. There is something what the Internet does not and never will do. The Internet will never do you smarter, more articulate, and more likeable.
7. OK, now let us look at how the Internet might change society and the way we live and work.

8. Right, I will move on now to business-to-business uses of the Internet and how they may develop over the next 20 years.
9. So, communication between people.
10. The importance of the Internet to each person is as varied as people. There is no single value, good or bad, that the Internet brings to everyone. Each person's experience is different.
11. The Internet and related technologies make the formation of new political alliance somewhat easier than in the past.
12. The most basic commercial importance of the Internet is how it moves the world slightly closer to a perfectly knowledgeable market.
13. The title of my talk is "*Internet applications: present and future*".
14. To get an idea about the effect of the Internet on personal communication, have a look at this graph showing the incredible increase in the number of e-mails being sent between people every day.
15. To sum up, I think the key thing is that the Internet is going to transform our lives in ways that we cannot fully predict yet.
16. Well, that is it. Thank you for listening.

## Unit 8

### INVENTIONS IN OUR LIFE

*"All great discoveries are made by men  
whose feelings run ahead of their thinking."*  
Charles Parkhurst (1842-1933)

What do you think is easier for a young person in any country — to name five rock stars or superstar athletes or five native and foreign inventors? It is quite possible to predict a full and immediate response to the first half of the question. However, that same teenager will be perplexed to name inventors, and he or she will likely be stuck after coming up with the name of Thomas Edison.

Unfortunately, we seem to remember not the inventors of common things for our daily needs that we are accustomed to use every day but either developers or producers of those items. Names of some inventors not always remain in our memory. It appears to be rather explainable as we keep in memory the trade or brand name of different necessary items used during our life.

Here are some names of the inventors and interesting facts about familiar things one gets used to. Do you know that?



*Athena  
Greek Goddess  
of Mechanical  
Skills*

- The Roman architect-engineer **Vitruvius** in the 1st century BC described **lifting platforms** that used pulleys and capstans, or windlasses, operated by human, animal, or water power.

- In **1767**, an Englishman, Dr. Joseph Priestley, created the first drinkable manmade glass of carbonated water.

- The **metric system of weights and measures (1791)** was designed by two French engineers, **Jean Delambre and Pierre Mechain?** The metric system became a fact in **June 1799**. The motto adopted for the new system was “*For all people, for all time*”.

- The first **passenger elevator** was put into service in the *Haughwout Department Store* in New York City in **1857**; driven by steam power, it climbed five stories in less than a minute and was a pronounced success.

- **Sholes Christopher Latham** is a U.S. inventor who developed the **typewriter** in **1864**.

- **Joseph Lister**, in England, opened the modern era of antiseptic surgery in **1865** and German chemical salesperson, **Friedrich Bayer** was the first developer and marketer of aspirin (**1899**).

- After **Guglielmo Marconi's** pioneering wireless broadcast of *Morse code* across the Atlantic Ocean in **1901**, experiments in practical radio communication were vigorously pursued on both sides of the Atlantic.

- **Insulin** was first isolated as a pancreatic extract in **1921** by the Canadian scientists Sir **Frederick G. Banting** and **Charles H. Best**.

- **Sergey Sergeevich Yudin**, of Moscow, in **1933**, used cadaver blood, and **Bernard Fantus**, of Chicago, four years later, used living donors as his source of supply.

- **Hugh Marriott** and **Alan Kekwick** at the *Middlesex Hospital*, London, introduced the continuous drip method, in which blood flows from a flask, in **1935**.

- **Aerosol spray** as a type of container was developed in **1941** by the American chemist **Lyle D. Goodhue**.

*Compare the following synonyms. Try to give their descriptions. What is the main difference between them and their functioning?*  
Device, gadget, machine, appliance, instrument, tool, implement.

*What are the most important inventions or innovations for you at work and at home?*

*Which of these inventions do you think are useful?*

*Which could you do without? Which do you actively dislike?*

- Mobile phone
- Automatic dishwasher
- Walkman
- Television
- Karaoke machine
- Microwave oven
- CD-player
- Personal computer

*What inventions or innovations do you associate with these names?*

|          |            |            |        |         |
|----------|------------|------------|--------|---------|
| Colt     | Hertz      | Edison     | Diesel | Singer  |
| Benz     | Gutenberg  | Mackintosh | Fermat | Ford    |
| Biro     | Dunlop     | Roentgen   | Bunsen | Hoover  |
| Gillette | Pilkington | Sax        | Otis   | Kellogg |

### Guessing quiz

*Guess the name of widespread things you often use. Again, you have to unscramble several anagrammed words naming these inventions. The definitions of these things will help you to compose their names.*

- **D + chief + hanker** — square piece of cotton, etc., for blowing the nose into or wiping the face.
- **Pat + toe** — a vessel with a lid, spout and handle, in which some drink is made and from which it is poured and served.
- **T + ten** — a portable shelter consisting of some flexible covering.
- **H + M + retro + meet** — an instrument by which temperatures are measured, consisting usually of a closed glass tube containing some liquid, most often mercury or alcohol, which expands or contracts with variations of temperature.
- **R + Peter + coal** — a kind of coffeepot in which boiling water is forced upwards and seeps down through the ground coffee.
- **R + he + mam** — a tool consisting of a solid head, usually steel, set cross-wise on a handle, used for beating metals or driving nails.
- **IC + heel + port** — an aircraft sustained in the air by engine-propelled blades rotating on a vertical axis, capable of moving vertically as well as horizontally.
- **Ion + pa** — a musical instrument with a keyboard by means of which felt-covered hammers to bring forth musical sounds stick metal strings.



- **Pin + Kan** — a piece of cloth used at meals for protecting clothing, for wiping the lips.
- **N + R + value + caecum** — an apparatus for cleaning carpets, floors and furniture by suction.
- **Ar + tin** — a connected series of railway cars.
- **Ira + tug** — a musical instrument with a long, fretted neck and a violin-like body, played by plucking the strings, usually six in number, with the fingers or a pick.

*Below there are some of the amazing achievements of modern technology.*

*Can you name them, describe and define the functions of each item?*



It was invented in 1842 by the Scottish inventor **Alexander Bain**, who received a patent for the “*automatic electrochemical recording telegraph*” in 1843.



The history of this computer device goes back to the first typewriter in 1868.



In 1886, **Josephine Cochrane** proclaimed, “*If nobody else is going to invent this, I’ll do it myself.*” Yes, she did invent the first type of this useful household equipment!



The *Hurley Machine Company* of Chicago, Illinois introduced the first electric-powered household item in 1908. It was invented by **Alva J. Fisher** and was issued a patent in August 1910.

**Stephen Poplawski** invented it in 1922.



**Chester Carlson** patented it on November 22, 1940. The *Xerox* company bought Carlson's technology.



*Ampex* sold the first VTR for \$50,000 in 1956. *Sony* sold the first VCR in 1971.

*Fuji* introduced the disposable type of it in 1986.



Technology for it was licensed from many different companies. *Philips*, *Sony*, *Matsushita* and *Toshiba* hold the patents. *Matsushita* was the primary company responsible for its development.

It was invented by **Pierre Verdon**, whose *Le Magi-Mix*, a compact household version of his own earlier restaurant-scaled *Robot-Coupe*, was first exhibited in Paris in 1971. **Carl Sontheimer**, an American engineer and inventor, refined Verdon's machines to produce the *Cuisinart*.)



***Here are some more important inventions and years of their discovery. Match the year of discovery with these inventions.***

|                                     |      |
|-------------------------------------|------|
| • <i>Automated digital computer</i> | 1591 |
| • <i>Compact disc</i>               | 1709 |
| • <i>Contraceptive pill</i>         | 1712 |
| • <i>Floppy disc</i>                | 1796 |
| • <i>Helicopter</i>                 | 1827 |
| • <i>Jet engine</i>                 | 1895 |
| • <i>Laser</i>                      | 1900 |
| • <i>Matches</i>                    | 1937 |
| • <i>Microwave oven</i>             | 1939 |
| • <i>Piano</i>                      | 1944 |
| • <i>Radio</i>                      | 1965 |
| • <i>Soft contact lens</i>          | 1947 |
| • <i>Steam engine</i>               | 1955 |
| • <i>Thermometer</i>                | 1958 |
| • <i>Vaccination</i>                | 1970 |
| • <i>X-rays</i>                     | 1979 |

***Describe the history of any invention you like most or consider the most important and necessary.***

***You are familiar with the traditional branches of science such as chemistry, physics, botany and zoology.***

***But what about some newer fields? Below come the definitions of these new areas.***

1. Study of the way geographical factors help to explain the basis of the power of nation states.
2. The application of physical laws and theories to stars and galaxies.
3. The study of climate as its effects on humans.
4. The study of physical systems at temperatures less than 183°C.
5. The study of technology related to the transfer of information (computers, digital electronics, and telecommunications).
6. The study of the artificial manipulation of the make-up of living things.
7. The study of the structure and function of the organic molecules associated with living organisms.
8. The study of the way information is moved and controlled by the brain or by machinery.
9. The study of the way nuclear power can be made useful.

*Can you match the above given definitions with the correct name of each new science mentioned below?*

- Genetic engineering
- Cybernetics
- Bioclimatology
- Nuclear engineering
- Astrophysics
- Molecular biology
- Information technology
- Geopolitics
- Cryogenetics

*Here is the abstract from the book of Doctor Magnus Pyke [7, p. 37] speculating at the end of the last century about our future.*

*Read the text and state whether his predictions appeared to come true.*

### **Our future**

Monsieur Mège-Mouries<sup>2</sup>'s invention of margarine was a great advance in technology. After all, it affected one of the most important things in our daily lives — eating. Nevertheless, it has taken margarine more than a century to become a serious rival to butter, and even now, it has not won absolute supremacy.

There is no doubt that many similar scientific and technological developments will have taken place by the time the writers of the 2030s sit down to look forward another 50 years to speculate on life in the 2080s. By that time cars may be running on hydrogen taken from ocean. We may all be living in automatically controlled homes, and carrying portable telephones with us wherever we go. The world's energy crisis may have become history, with the successful application of nuclear fusion. We may be entertained by three-dimensional television, and take two-month holidays. Our education may last until the age of 25, and we may all be living for 120 years. Other, yet unimagined, changes may lie beyond the horizon waiting to take us by surprise. Whatever form these changes take, the face of life in the future will certainly be significantly different.

Yet, speaking as one who has the advantage of being able to look back more than 50 years, I look forward to the future with confidence, because, in spite of all the changes, I predict that human beings will still be able to exercise choice in deciding how to run their lives.

Looking back 50 years, we can see enormous changes. In the 1930s, there were many people in the world who had never seen a car or listened to a radio. A television set was still a technological dream. The moon was untroubled by man and his missiles and its back was still an unseen mystery. Nuclear reactions existed only in theoretical physics and to fly the Atlantic from one continent to another was an adventure experienced by few. However, if we were suddenly

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<sup>2</sup> The French chemist H. Mège-Mouries developed margarine in the late 1860s and was given recognition in Europe and a patent in the United States in 1873.

transported back in time fifty years, I doubt if we would have any great problems settling into the pattern of the everyday life of the 1930s.

Similarly, it seems to me that fifty years from now people will choose to keep the principles and values that they have always believed in. New invention in the future may change the pattern of life, but the human mind that guides it will not alter. Monsieur Mége-Mouries's own nation may be right when they say '*plus ça change, plus c'est la meme chose*'<sup>3</sup>.

***Now some questions for you to dwell upon them:***

1. What kind of book in your opinion is *Our Future*?
2. Do you think Dr Pyke mentions margarine to make the point that:
  - a) technological advances are very important,
  - b) people are very slow to adapt to new things,
  - c) artificial things are taking the place of natural ones?
3. What is Dr Pyke certain about when he talks about the 2030s?
4. What changes does he predict by the 2030s in energy, medicine, work and leisure?
5. Which of his predictions did come true?
6. According to Dr Pyke, in what way were the 1930s
  - a) very different from the 1980s,
  - b) not very different from the 1980s?
7. Why does Dr Pyke feel we do not have to worry much about the future?
8. Comment on the French saying in the last passage. How does this apply to the passage?
9. Are you as optimistic for the future as Dr Pyke was?
10. Could you predict what might happen in 2050s?

***Choose one of the topics to prepare an individual report or presentation:***

1. Biography of the French chemist Mége-Mouries.
2. Describe an ideal automatically controlled home of yours.
3. Main achievements of the French chemist Mége-Mouries.
4. Modern achievements in biology.
5. Modern achievements in education.
6. Modern entertainment technologies.
7. Modern space technologies.
8. The history of margarine production technology.
9. The more things change, the more they stay the same.
10. The world's energy crisis.

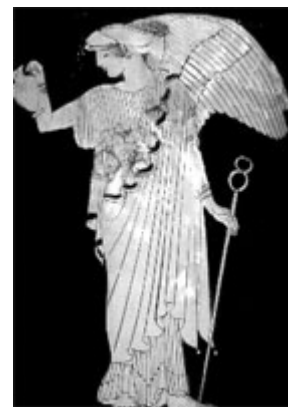
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<sup>3</sup> The more things change, the more they stay the same.

## INVENTIONS IN CHEMISTRY

*“Science and art belong to the whole world,  
and before them vanish the barriers of nationality.”*  
Johann Goethe (1749-1832)

Chemistry was considered mostly as the science of the future for the first two-thirds of the 20th century. The potential of chemical industry providing advanced society with products appeared to be unlimited. It is easy to overestimate the fundamental role of chemistry in modern society, but no one will dispute that chemical products are essential if the world’s population is to be clothed, housed, and fed. The world’s reserves of fossil fuels (e.g., oil, natural gas, and coal) are far from being inexhaustible; some of them may be over as soon as the 21st century. That is why we set our hopes on chemistry as new chemical processes and materials will make available a crucial alternative energy source. The conversion of other sources of energy such as solar, wind or nuclear ones into more concentrated, useful forms, for example, will heavily rely on discoveries in chemistry. Long-term, environmentally friendly solutions to pollution problems of air, water and soil are attainable only due to profound knowledge of chemical processes and their effects, as *“chemical problems require chemical solutions.”* Thorough and serious chemical research cannot help promoting a deeper understanding of the characteristics of both natural and synthetic materials, result in the discovery of new substances that will facilitate future generations to better supply their needs and much easier solve their problems.



*Iris Messenger  
of the Gods*

Progress in chemistry is possible due to the inquisitive minds and searching looks of distinguished scientists all over the world in different periods. Now let us try to concentrate on those scientists who were not only great chemists but also bright inventors and discoverers.

It is an open secret that until as recently as the 17th century Muslims were considered authorities in several sciences. Besides medicine, astronomy and mathematics, chemistry is the fourth major science in which Muslims have made the greatest contribution. Among the long list of great Muslim chemists, there are two names, *Jabir Ibn Hayyan* and *Zakariya Razi*, reaching clear-cut distinction. The French historian and Arabist Philip K. Hitti acknowledges the greatness of Arabs in this branch of science. In his illuminating book *History of the Arabs* he says, *“After materia medica, astronomy and mathematics, the Arabs made their greatest scientific contribution in chemistry. In the study of*

chemistry and other physical sciences, the Arabs introduced the objective experiment, a decided improvement over the hazy speculation of Greeks. Accurate in the observation of phenomena and diligent in the accumulation of facts, the Arabs nevertheless found it difficult to project proper hypotheses” [8].



**Jabir Ibn Hayyan** (722 AD — 815 AD) also known as **Geber** in Europe is considered as the founder of chemistry. He obtained sulfuric acid by distillation of alum. He identified many new acids, alkalines and salts. He devised and perfected chemical processes such as sublimation, crystallization, distillation, evaporation, and filtration. He initiated the classification of materials into spirits, metals and minerals. Ten centuries before John Dalton, Jabir Ibn Hayyan defined chemical combinations as a union of the elements together, in too small a particle for the naked eye to see, without loss of character.

**Al-Kindi** (801 — 873) from Kufah (Iraq) is another distinguished scholar who made a lasting impact on the development of chemistry. His work gave raise to the pharmaceutical science as his book *Kitab Kimiya al-Itr (Book of the Chemistry of Perfume and Distillations)* contains more than 100 recipes for fragrant oils, salves, aromatic waters and substitutes or imitations of costly drugs.

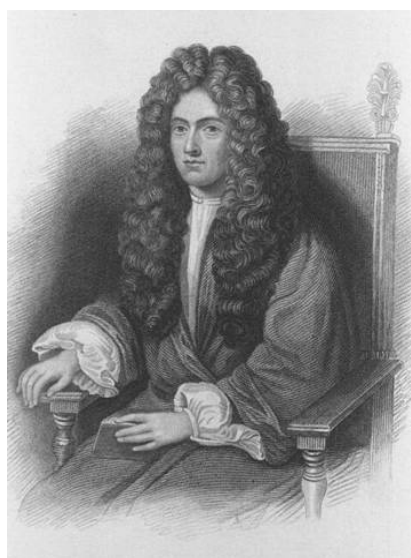


**Al-Razi** (865 — 925 AD), in full **Abu Bakr Muhammad Ibn**, is a Persian physician, philosopher, and scholar. Razi made fundamental and enduring contributions to the fields of medicine, alchemy, and philosophy, recorded in over 184 books and articles in various fields of science. Al-Razi’s achievements are of exceptional importance in the history of chemistry, since he put the first systematic classification of chemical substances, reactions and apparatus at our disposal. In his books, he presented carefully observed and verified facts described in a language almost entirely free from mysticism and ambiguity.

Al-Razi’s scheme of classification of the substances used in chemistry shows sound research on his part. He divided the subject of ‘matter’ into three categories demonstrating his knowledge of plant, animal and mineral origin of drug components. He gave a detailed description of equipment and tools of interest used by either alchemist or apothecary. Moreover, he specified seven alchemical procedures and techniques among which there are sublimation and condensation of mercury, precipitation of sulfur and arsenic calcinations of minerals. Of great interest is Al-Razi’s classification of minerals into six divisions, containing four spirits, seven bodies, thirteen stones, seven vitriols, seven borates and eleven salts. Such approach to minerals categorization attaches his inference modern chemical value.



Al-Razi also made an inventory of apparatus widely used in alchemy. This alchemic ‘equipment’ list was comprised of two accessories classes. The first division of facilities described was used for the dissolving and melting of metals. Among them, one could find the Blacksmith’s hearth, bellows, crucible, thongs (tongue or ladle), macerator, stirring rod, cutter, grinder (pestle), file, shears, descensory (*a vessel used in alchemy to extract oils*) and semi-cylindrical ironmould. Utensils used to perform the processes of transmutation as well as various parts of the distilling apparatus included retort, alembic, shallow iron pan, pottery kiln, large oven, cylindrical stove, glass funnel, alundel (*system of cylindrical furnaces used for the reduction of mercurial ores. Retorts of glass, called alundels, collect the condensed vapour.*), heating lamps, mortar, cauldron, sand and water bath, sieve, chafing dish, glass cups, flasks, phials, and beakers. Al-Razi laid down the firm foundations of modern chemistry by setting up, for the first time, the laboratory in the modern sense, designing, describing and using more than twenty instruments, many of them are still in use today.



**Robert Boyle** (1627 — 1691) is an Anglo-Irish chemist and natural philosopher noted for his pioneering experiments on the properties of gases and his espousal of a corpuscular view of matter that was a forerunner of the modern theory of chemical elements. He was a founding member of the *Royal Society* of London. He is more commonly recognized as the ‘*father of chemistry*’, in which field he was responsible for the recognition of an element as a material that cannot be resolved into other substances. He also carries out a series of innovative chemical experiments including those on detailed investigation of acids and bases. However, Boyle’s contribution to the theory of steam power is

also known.

**Nicholson William** (1753 — 1815) is an English chemist, discoverer of the electrolysis of water, which has become a basic process in both chemical research and industry. Nicholson used to work as a hydraulic engineer, inventor, translator, and scientific publicist. He invented a *hydrometer* (an instrument for measuring the density of liquids) in 1790. In 1800, after he heard of the invention of the electric battery by the Italian physicist **Alessandro Volta**, he built one of his own. He then discovered that when leads from the battery are placed in water, the water breaks up into hydrogen and oxygen, which collect separately to form bubbles at the submerged ends of the wires. With this



discovery, Nicholson became the first man to produce a chemical reaction by electricity. In 1797, Nicholson founded the *Journal of Natural Philosophy, Chemistry and the Arts*, which was the first independent scientific journal. The success of this periodical inspired the creation of several rival scientific journals in England that eventually drove Nicholson's periodical out of business. Nicholson's *Introduction to Natural Philosophy* (1781) was the most successful of his published works.



**Daniell John Frederic** (1790 — 1845) is a British chemist and meteorologist who invented the Daniell cell, which was a great improvement over the voltaic cell used in the early days of battery development. In 1820 Daniell invented a dew-point hygrometer (*a device that indicates atmospheric humidity*), which came into widespread use. In his *Meteorological Essays and Observations* (1823), Daniell summarized his findings on the atmosphere and trade winds behaviour, in addition to giving details of improved meteorological equipment. In a later edition, he also discussed the meteorological effects of solar radiation and the cooling of the Earth. Daniell's *Essay on Artificial Climate Considered in Its Applications to Horticulture* showed the importance of humidity in greenhouses. In 1831, he became the first professor of chemistry at the newly founded *King's College* in London. One year later, for his invention of a new pyrometer (*a heat-measuring device*) and for his papers describing detailed use of it, Daniell received the *Rumford Medal* of the *Royal Society*. In 1836, Daniell proposed an improved electric cell that supplied an even current during continuous operation. The Daniell cell gave new impetus to electric research and found many commercial applications. In 1837, Daniell was presented the highest award of the *Royal Society*, the *Copley Medal*, for the invention of the Daniell cell.

**Davy Edward** (1806 — 1885) is an Australian physician, chemist, and inventor who devised the electromagnetic repeater for relaying telegraphic signals and invented an electrochemical telegraph (1838). Davy, who wrote an *Experimental Guide to Chemistry* (1836), immigrated in 1839 to Australia, where, in addition to practicing medicine, he worked as an editor, farmer, and factory manager. Before leaving Great Britain, he sold the patent for his telegraph; the purchasers never exploited the invention commercially, and for several decades, Davy's contributions were ignored. He developed the electromagnetic repeater, which consisted of a relay to pick up and magnify electrical signals, in about 1836.

**Bunsen Robert Wilhelm** (1811 — 1899) is a German chemist who, with Gustav Kirchhoff, about 1859 observed that each element emits a light of characteristic wavelength. Those studies opened the field of spectrum analysis, which became of great importance in the study of the Sun and stars and also led

Bunsen almost immediately to his discovery of two alkali-group metals, cesium and rubidium.

He found an antidote to arsenic poisoning in freshly precipitated, hydrated ferric oxide (1834). In 1837, he began his only notable venture into organic chemistry with a study of the highly toxic, arsenic-containing compound cacodyl. During six years of work with it, he lost the sight in one eye from an explosion and nearly killed himself from arsenic poisoning. His research resulted in profitable studies of organometallic compounds by his student Edward Frankland.



In 1841, he invented the carbon-zinc electric cell known by his name. To measure the light produced by it, he developed the grease-spot photometer (1844). He was the first to obtain magnesium in the metallic state and study its physical and chemical properties, demonstrating the brilliance and reaction-producing (actinic) qualities of the flame when magnesium is burned in air.

Bunsen also invented the filter pump (1868), the ice calorimeter (1870), and the vapour calorimeter (1887). Though he is generally credited with the invention of the Bunsen burner, he seems to have contributed to its development only in a minor way.



**Solvay Ernest** (1838 — 1922) is a Belgian industrial chemist, best known for his development of a commercially viable ammonia-soda process for producing soda ash (*sodium carbonate*), widely used in the manufacture of such products as glass and soap. In the ammonia-soda process, common salt, sodium chloride, is treated with ammonia and then carbon dioxide, under carefully controlled conditions, to form sodium bicarbonate and ammonium chloride. When heated, the bicarbonate yields sodium carbonate, the desired product; the ammonium chloride is treated with lime to produce ammonia for reuse and calcium chloride. For some years after its introduction, the ammonia-soda process encountered stiff competition from the older *Leblanc process*, but it ultimately prevailed because it produced soda ash more cheaply.

Solvay solved the practical problems of large-scale production by his invention of the *Solvay carbonating tower*, in which an ammonia-salt solution could be mixed with carbon dioxide. In 1861, he and his brother Alfred founded their own company and in 1863 had a factory built. Production started in 1865, and by 1890 Solvay had established companies in several foreign countries. This success brought Solvay considerable wealth, which he used for various philanthropic purposes, including the founding of various international institutes of scientific research in chemistry, physics, and sociology. The Solvay

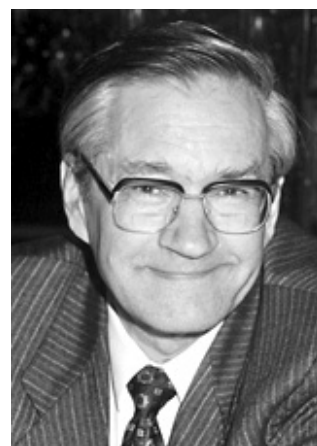
conferences on physics were particularly noted for their role in the development of theories on quantum mechanics and atomic structure.



**Svedberg Theodor H. E.** (1884 — 1971) is a Swedish chemist who won the *Nobel Prize* for Chemistry in 1926 for his studies in the chemistry of colloids and for his invention of the ultracentrifuge, an invaluable aid in those and subsequent studies.

Svedberg's early research was on colloids, in which particles are too small to be resolved by ordinary light microscopes are dispersed throughout water or some other substance. The particles in colloid solutions are so small that the jostling of the surrounding water molecules keeps them from settling out in accord with gravity. To better study the particles, Svedberg used centrifugal force to mimic the effects of gravity on them. His first ultracentrifuge, completed in 1924, was capable of generating a centrifugal force up to 5,000 times the force of gravity. Later versions generated hundreds of thousands of times the force of gravity. Svedberg found that the size and weight of the particles determined their rate of settling out, or sedimentation, and he used this fact to measure their size. With an ultracentrifuge, Svedberg went on to determine precisely the molecular weights of highly complex proteins such as hemoglobin. In later years, he made studies in nuclear chemistry, contributed to the improvement of the cyclotron, and helped his student Arne Tiselius in the development of the use of electrophoresis to separate and analyze proteins.

**Ernst Richard R.** (1933 — ), in full **Richard Robert Ernst**, a Swiss researcher and teacher who in 1991 won the *Nobel Prize* for Chemistry for his development of techniques for high-resolution nuclear magnetic resonance (NMR) spectroscopy. Ernst's refinements made NMR techniques a basic and indispensable tool in chemistry and also extended their usefulness to other sciences. In 1966, working with an American colleague, Ernst discovered that the sensitivity of NMR techniques (hitherto limited to analysis of only a few nuclei) could be dramatically increased by replacing the slow, sweeping radio waves traditionally used in NMR spectroscopy with short, intense pulses. His discovery enabled analysis of a great many more types of nuclei and smaller amounts of materials. In 1968, he returned to Switzerland to teach at his *alma mater*. He was made assistant professor in 1970 and full professor in 1976. His second major contribution to the field of NMR spectroscopy was a technique that enabled a high-resolution, "two-dimensional" study of larger molecules than had previously been accessible to NMR. With Ernst's refinements, scientists were able to determine the three-dimensional structure of organic and inorganic



compounds and of biological macromolecules such as proteins; to study the interaction between biological molecules and other substances such as metal ions, water, and drugs; to identify chemical species; and to study the rates of chemical reactions. Ernst also was credited with many inventions and held several patents in his field.



**Lee Yuan T.** (1936 — ), in full *Yuan Tseh Lee*, a Taiwanese-American chemist who, with Dudley R. Herschbach and John C. Polanyi, received the *Nobel Prize* for Chemistry in 1986 for his role in the development of chemical-reaction dynamics. Lee was educated in Taiwan and at the University of California at Berkeley (Ph.D., 1965). He did postdoctoral work at Harvard University and Berkeley and then taught at the University of Chicago from 1968 to 1974. He became a U.S. citizen in 1974 and moved from Chicago to Berkeley, where he continued his research. As a postdoctoral researcher, Lee experimented with and further developed Herschbach's invention of the "crossed molecular beam technique" — a technique (derived from elementary particle physics) in which beams of molecules are brought together at supersonic speeds under controlled conditions to allow detailed observation of the events that occur during chemical reactions. Lee extended Herschbach's technique, introducing mass spectroscopy to identify the products resulting from the reactions of oxygen and fluorine atoms with complex organic compounds.

***Prepare a report (or a presentation) of the biography of any of these outstanding scientists. Try to find and present the information about his early days, education, contributions to chemistry, social position and interests, road to inventions, best-known works, personal life and awards as well as external links if possible.***

***Complete the test using the active material from the text as well as some additional facts from the biographies of these scientists.***

1. Until as recently as the 17th century, Muslims were considered authorities in
  - a) physics and natural sciences.
  - b) medicine, astronomy and chemistry.
  - c) in all sciences except chemistry.
2. One of the brightest and greatest Muslim chemists is Jabir Ibn Hayyan. Ten centuries before John Dalton he
  - a) defined chemical combinations as a union of the elements together.

- b) initiated the classification of materials into spirits, metals and minerals.
  - c) obtained sulphuric acid by distillation of alum.
3. Al-Kindi is remembered till now because of his famous book containing
- a) description of perfected chemical processes.
  - b) recipes and imitations of costly drugs.
  - c) brilliant history of the Arabs.
4. Jabir Ibn Hayyan (Geber), a great Muslim Chemist of the 8th century CE, modified the Aristotelian doctrine of the four elements and presented the so-called sulfur mercury theory of metals. Unlike his Greek predecessors, he did not merely speculate, but
- a) devised and perfected chemical processes.
  - b) performed experiments to reach certain conclusions.
  - c) involved alchemists in his experiments.
5. Jabir's contribution to Chemistry is very great. He gave a scientific description of two principle operations of Chemistry. One of them is calcination, which is employed in the extraction of metals from their ores. The other is reduction that is employed in numerous chemical treatments. These are the fundamental methods employed in the purification of chemical substances, enabling the chemist
- a) to classify chemical substances.
  - b) to employ numerous chemical treatment.
  - c) to study their properties and uses, and to prepare them.
6. In the same century, Jabir's work was further advanced by Al-Razi who wrote many chemical treatises, and described a number of chemical instruments. He applied his chemical knowledge for medical purposes, thus laying the foundation of Applied Chemistry. Razi made fundamental and enduring contributions to the fields of
- a) medicine, astronomy and mathematics.
  - b) medicine, alchemy, and philosophy.
  - c) astronomy, mathematics and chemistry.
7. Jabir thought that the 'soul' of the metal was
- a) gold.
  - b) hydrargyrum.
  - c) sulphur.
8. According to Jabir formation of gold and other metals was going rather slowly and gradually, that is why the gold 'ripening' might be forwarded by

- a) using of perfected chemical processes.
  - b) addition of special acids and salts.
  - c) a special remedy such as elixir causing changes of the ratio between hydrargyrum and sulphur in metals.
9. Chemistry as a science is of no doubt the innovation of
- a) ancient alchemists,
  - b) Muslims,
  - c) Greek scholars and philosophers, who have brought it to the perfection remaining unsurpassed till the end of XVII century.
10. Zakariya Ar-Razi was the first to successfully and properly classified substances. While Jabir and some other Arab chemists subdivided minerals into bodies (gold, silver, etc) and spirits (sulphur, arsenic), Razi classified all mineral substances into
- a) only vegetable.
  - b) animal and vegetable.
  - c) vegetable, animal and mineral.
11. Jabir believed the universe to be ruled over by number 17 as
- a) metals possessed 17 power.
  - b) there were 17 metals known.
  - c) number 17 was a magic number.
12. Working under the supervision of Herschbach Yuan Lee has made the new apparatus being a unique device for obtaining crossing molecular beams. It took the scientist
- a) 10 months.
  - b) a year.
  - c) all his life.
13. Boyle, a person of encyclopedic knowledge, being engaged with the problems of biology, medicine, physics and chemistry displayed a keen interest in
- a) alchemy, astronomy and physics.
  - b) mechanics and mathematics.
  - c) philosophy, theology and linguistics.
14. In 1660 Boyle modified air pump by Gerike and made series of experiments with its help
- a) to develop the modern theory of chemical elements.
  - b) to demonstrate air elasticity and to determine its relative density.
  - c) to learn the properties of gases.



15. Solvay developed the methods of gas purification and started searching of a commercially viable ammonia-soda manufacturing. Soda ash was widely used
- in the production of glass and soap, dyeing, tanning and papermaking, wine-making, medicine and fizzy drinks production.
  - in the production of dyeing machines.
  - only in food industry.
16. After the defense of his thesis in 1962, Ernst decided to leave the university and found the job in the world known company “*Varian Associates*” famous for its designing and manufacturing of
- down hole gamma-ray spectrometers.
  - NMR spectrometers.
  - absorption spectrometers.
17. Davy’s casual observation initiated the development of
- colloid chemistry.
  - nuclear chemistry.
  - clathrate chemistry.
18. In 1816 Daniell began to publish the well known journal
- “*Quarterly Journal of Science and Arts*”.
  - “*Gasometrische Methoden*”.
  - “*Meteorological Essays and Observations*”.
19. In 1837, Daniell was presented the highest award of the Royal Society,
- becoming the Member of the *Royal Society*,
  - the *Copley Medal*,
  - the *Nobel Prize* for Chemistry, for the invention of the Daniell cell.
20. William Nicholson was a renowned English chemist who was also a writer on natural philosophy and chemistry as well as a translator, journalist, publisher, scientist, and inventor. In 1797, Nicholson founded the first independent scientific journal generally known as *Nicholson’s Journal*, the earliest work of its kind in Great Britain—the publication continued until 1814. It was called
- “*Experimental Guide to Chemistry*”.
  - “*Meteorological Essays and Observations*”.
  - the “*Journal of Natural Philosophy, Chemistry and the Arts*”.
21. Yuan Tseh Lee was the first Taiwanese-born *Nobel Prize* laureate, who, along with the German-Canadian John C. Polanyi and American Dudley R. Herschbach won the *Nobel Prize* in Chemistry in 1986

- a) “for their contributions to the chemistry of colloids”.
  - b) “dynamics of chemical elementary processes”.
  - c) “for their contributions to the development of techniques for high resolution nuclear magnetic resonance spectroscopy”.
22. His name is best known for his invention of an electric battery much better than voltaic cells. He also invented the dew-point hygrometer known by his name (1820), and a register pyrometer (1830); and in 1830 he erected in the hall of the *Royal Society* a water-barometer, with which he carried out a large number of observations (1832). A process devised by him for the manufacture of illuminating gas from turpentine and resin was in use in New York for a time. The name of this distinguished inventor is
- a) Boris Semenovitch Yakobi.
  - b) Alessandro Giuseppe Antonio Anastasio Volta.
  - c) John Frederic Daniell.
23. He was a renowned English chemist who was also a writer on natural philosophy and chemistry as well as a translator, journalist, publisher, scientist, and inventor. He bestowed much attention upon the construction of various machines for comb-cutting, file-making, cylinder printing another uses — he also invented an areometer. We remember the name of this inventor is
- a) William Nicholson.
  - b) John Frederic Daniell.
  - c) Edward Davy.

***Find good Russian equivalents of the English sentences based on the material of the text in Unit 9.***

1. Алхимики в течение ряда веков топтались на месте. К шести металлам, которые были известны с давних пор, они прибавили всего пять новых «элементов» — мышьяк, сурьму, висмут, цинк, фосфор. Число химических соединений благодаря их стараниям увеличилось раз в десять. Было разработано простейшее оборудование.
2. Аль-Кинди — первый крупный арабоязычный философ, которого называли «философом арабов». В круг научных интересов Аль-Кинди входили и метафизика, и логика, и этика, и математика, и астрономия, и медицина, и метеорология, и теория музыки, и оптика.
3. Аль-Рази — один из величайших врачей арабского мира, человек энциклопедических знаний, астролог, алхимик. В своих трудах (из 184 до нас дошло 61) развивал основы астрологической медицины, сводя их воедино, за что называли его «арабским Парацельсом». Аль-Рази, живший в Багдаде, ввел в употребление гидростатические весы для



- определения удельного веса, что особенно интересовало арабских физиков и привело к введению «рейтера» в точных весах.
4. Беспорядочно перетирая, смешивая, сжигая, растворяя, перегоняя вещества, подвергая свою жизнь опасности (не раз случалось, что лаборатории взлетали на воздух), алхимики добывали знания, которые подготовили рождение химии как науки.
  5. В 1811 г. английский химик Дэви пропускал газообразный хлор через воду, охлажденную до 0°С, для очистки его от примеси хлороводорода. Дэви с удивлением увидел в сосуде желто-зеленые кристаллы. Только в нашем веке было доказано, что кристаллы, полученные Дэви, являются нестехиометрическими соединениями включения, или клатратами.
  6. В 1967 Ли перешел работать в Гарвардский университет в лабораторию Д. Хершбаха. Еще в Беркли небольшая группа студентов и аспирантов вместе с Хершбахом сконструировала прибор, в котором два молекулярных пучка пересекались, при этом один пучок содержал атомы калия, а другой состоял из углерода, водорода и йода.
  7. В 1991 научная деятельность Эрнста была отмечена Нобелевской премией «За вклад в развитие методологии спектроскопии ядерного магнитного резонанса (ЯМР) высокого разрешения».
  8. Выделяющиеся на медном электроде и прилипающие к нему пузырьки водорода сильно мешают работе элемента. На это обстоятельство в 1836 обратил внимание Джон Фредерик Даниель — британский химик и метеоролог. В его конструкции цинковый электрод погружен в раствор цинкового купороса (сульфата цинка), а медный — в раствор медного купороса (сульфата меди). Чтобы оба электролита не смешивались, Даниель разделил их пористой перегородкой из необожженной глины.
  9. Гебер писал, что любое предположение может быть принято только тогда, когда будет подтверждено точным доказательством. Главное в химии, наставлял он, — заниматься практической работой и производить опыты, ибо без этого нельзя достичь успеха. Гебер подробно описал все приемы, которыми пользовался тогда химик-исследователь: кристаллизацию, возгонку, растворение, обжиг и другие операции. Азотная кислота, играющая в современной промышленности огромную роль, впервые была получена этим ученым и детально описана в его книге «Ящик мудрости».
  10. Именно Ябир Ибн Хайян предложил разделять все вещества на спирты, металлы и минералы. Хайян описывает также различные химические операции (перегонку, возгонку, растворение, кристаллизацию и др.), а также некоторые химические препараты (купоросы, квасцы, щёлочи, нашатырь и др.), излагает способы

- получения уксусной кислоты, слабого раствора азотной кислоты, свинцовых белил.
11. Исследование Ж. Перреном, Т. Сведбергом и Р. Зигмонди броуновского движения коллоидных частиц на основе теории, разработанной в 1905 г. А. Эйнштейном и М. Смолуховским, позволило доказать реальность существования молекул и правильность молекулярно-кинетических представлений.
  12. Коллоидные системы представляют собой смесь, в которой мельчайшие частицы одного вещества диспергированы (рассеяны) в другом веществе. Коллоидные частицы крупнее, чем частицы обычных (истинных) растворов, но не настолько, чтобы их можно было рассматривать под микроскопом или чтобы они выпадали в осадок под действием силы тяжести. Их размеры варьируются от 5 нанометров (5 миллиардных долей метра) до приблизительно 200 нанометров. Примерами коллоидных систем являются «индийские чернила» (частицы угля в воде), дым (твердые частицы в воздухе) и молочный жир (крошечные шарики жира в водяном растворе).
  13. Ли вспоминал, что выбор будущей профессии определило знакомство с биографией Мари Кюри: «Прекрасная жизнь этого удивительного человека, ее преданность науке, ее самоотверженность, ее идеализм, наконец, привели меня к решению стать ученым».
  14. Многие другие опыты Бойль производил при помощи воздушного насоса, незадолго перед тем изобретённого Отто фон Герике, но получившего различные усовершенствования в руках Бойля.
  15. Новое слово в химии было сказано Р. Бойлем, который показал несостоятельность представлений об элементах-началах и дал первое научно обоснованное определение химического элемента как предела разложения вещества на составные части. Бойль впервые поднял химию на уровень науки, придав первостепенное значение эксперименту — анализу и синтезу.
  16. Родоначальником научной аналитической химии считают Р. Бойля, который ввел понятие «химический анализ», определив его как разложение веществ на составляющие их элементы.
  17. Рубидий, химический элемент I группы периодической системы, относящийся к щелочным металлам, был открыт Р. Бунзеном и Г. Кирхгофом в 1861 г., а годом раньше ими же был открыт цезий.
  18. Первым профессором химии во вновь созданном Королевском колледже Лондона стал Даниэль Джон Фредерик в 1831 г.
  19. Сольве по праву считается первым инженером-технологом в области промышленного производства соды.
  20. Только благодаря запасу сведений, собранных алхимиками, можно было начать действительно научное изучение химических явлений. Но

химия стала наукой лишь после того, как она освободилась от алхимии. Начало этому «освобождению» положил в XVII веке Р. Бойль.

21. Эрнест Гастон Сольве — бельгийский химик-технолог и предприниматель. Разработал аммиачный способ получения соды из поваренной соли, основал химическую компанию *Solvay* в 1863. В 1911 был инициатором международного форума физиков, именуемым в честь него Сольвеевским конгрессом. С 1911 по 2005 год прошло 23 конгресса.

*Prepare an individual presentation of one of the Nobel Prize winners in the field of chemistry.*

Unit 10

### “LADIES EDISONS”

*“Any woman who is a first in a field previously dominated by men has the responsibility of opening doors for other women”.*

Pauline Crabbe [11]

*Speculate on the following pre-reading questions:*

1. Can you rattle off the names of five prominent inventors?
2. Can you blurt out the names of five women inventors of Russia?
3. Can you designate the names of five American women inventors?
4. Whose privilege do you think is creation of something new — men’s or women’s?
5. Who in your opinion prevail in innovation area — men or women?

Jerome Lemelson [12], an independent inventor who founded the *Lemelson Center*, was concerned with the public awareness of invention in the United States. He found out that an American of any age could not blurt out the names of at least five women inventors. Yet, the history of women inventors is as long as that of their male counterparts.

**Sybilla Masters** (c. 1670-1720), for example, is often named as the first woman inventor in the American colonies. There are no exact records of Masters’ date and place of birth. Her parents, William and Sarah Righton, were Quakers, her father being a merchant marine. Sybilla married Thomas Masters, a successful merchant from Philadelphia, Pennsylvania, around 1695. He held several political posts, including mayor of Philadelphia from 1707 to 1708.

Between 1712 and 1715, Sybilla Masters designed a corn pulverizer, which cleaned and cured Indian corn grown in the American colonies. Masters’

invention consisted of a pestle descending through a wooden cylinder to a mortar with the corn. Continuous movements of the pestle ground the corn into meal coming into chests for drying. In 1715, the English courts awarded a patent — albeit, to her husband Thomas — for a method of making cornmeal from maize — “a new invention”, the patent clearly stated, “found out by Sybilla, his wife”. In 1716, Sybilla Masters got another English patent in her husband’s name. Her second invention concerned the process of straw and palmetto leaves forming and staining. They were used for the adornment of women’s hats and bonnets. Unfortunately, any diagrams or descriptions of the process were lost.

Nevertheless, Sybilla Masters is widely recognized for her daring inventiveness and first modest marketing attempts. True sense of her innovative thinking lies in her exceptional commercial enterprise for a woman of her day and bold intrusion into patenting having been exclusively male realm years before.

**Mary Kies (1752-1837)** earned a patent in her own name in 1809 for a way of weaving straw that was introduced in the New England hat manufacturing trade. On May 15 1809, Mary Dixon Kies received the first U. S. patent issued to a woman. Kies, a Connecticut native, invented a process for weaving straw with silk or thread. First Lady, Dolley Madison praised her for boosting the nation’s hat industry. Unfortunately, the patent file was destroyed in the great *Patent Office* fire in 1836.



Until about 1840, only 20 other patents were issued to women. The inventions related to apparel, tools, cook stoves, and fireplaces.

The *Patent Act* of 1790 opened the door for anyone, male or female, to protect his or her invention with a patent. However, because in many states women could not legally own property independent of their husbands, many women inventors did not bother to patent their new inventions. Mary Kies broke that pattern on May 5, 1809.

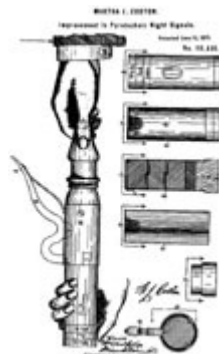
Mary Kies was not the first American woman to improve hat making. In 1798, New Englander **Betsy Metcalf** invented a method of braiding straw. Her method became very popular, and she employed many women to make her hats, but she did not patent her process. When asked why, Metcalf said she did not want her name being sent to Congress. Kies had a different perspective, and she could not have picked a better time to secure her new product, because the U.S. government had stopped importing European goods. (*Napoleon was at war with many nations of Europe at the time, and one way he tried to win the war was to block trade and hurt his enemies economically. The U.S. did not want to be drawn into this conflict.*) President Madison was looking for American industries to replace the lost European goods.



**Martha Coston (1826-1886)** perfected then patented her deceased husband's idea for colored signal flares after his early death. Coston not only patented the flare system, used by the navy in the Civil War, but also sold the rights to the government for \$20,000 and earned a contract to manufacture the flares.

Martha Coston perfected husband's idea for a pyrotechnic flare. Coston's husband, a former naval scientist, died leaving behind only a rough sketch in a diary of plans for the flares. Martha Coston developed the idea into an elaborate system of flares called *Night Signals* that allowed ships to communicate messages nocturnally. She invented a system of maritime signal flares based on color and pattern. Using various color combinations, these flares made ship-to-ship and ship-to-shore communication possible. Coston's flares served as the basis of a communication system that helped to save lives and to win battles. Martha Coston credited her late husband with the first patent for the flares, but in 1871 she received a patent for an improvement exclusively her own.

In February 1859, C. S. McCauley, Captain and Senior Officer of the United States Navy, recommended the signals to the Secretary of the Navy, Isaac Toucey. Coston sold her system to the U.S. Navy for \$5,000, and later sold the U.S. patent rights to the Navy for \$20,000. The governments of France, Italy, Denmark, the Netherlands, and Haiti also adopted her system.



*Martha Coston's drawings. 1871 patent. The use of the pyrotechnic night signal is shown here. Loss of USS Monitor, December 31, 1862.*

As of the late 1970s, the *Coston Supply Company* established by Mrs. Coston remained in business. This system of bright, long-lasting signal flares revolutionized naval communication and continues to be in use.

Other women who have made notable contributions to the 19th century maritime industry include **Ida Lewis**, lighthouse keeper; **Mary Miller**, licensed pilot; and **Mary Patten**, clipper ship captain.

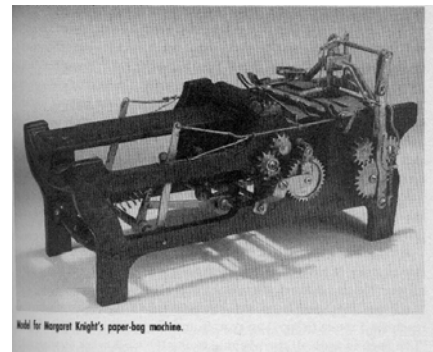


**Margaret Knight (1838-1914)** is known as Queen of Paper Bags. She also is a prolific American inventor of machines and mechanisms for a variety of industrial and everyday purposes. Margaret Knight's many inventions included a machine for making square-bottomed paper bags; her original patent is dated November 15, 1870.

Margaret Knight was an employee in a paper bag factory when she invented a new machine part that would automatically fold and glue paper bags to create square bottoms for paper bags. Paper bags had been more like envelopes before. Workers reportedly refused her advice when first installing the equipment because they mistakenly thought, "What does a woman know about machines?"

Margaret Knight can be considered the Mother of the grocery bag; she founded the *Eastern Paper Bag Company* in 1870.

Margaret Knight was born in 1838. She received her first patent at the age of 30, but inventing was always part of her life. Margaret (or 'Mattie' as she was called in her childhood) made sleds and kites for her brothers while growing up in Maine. Margaret Knight started inventing when she was 12. She was often called a tomboy but she said it did not bother her. Margaret invented a stop mechanism when she was 12 for machines after she witnessed a co-worker to be seriously injured by a machine when it would not stop. This saved the lives of many factory workers so she was hired to work in a paper-bag factory. While there, she discovered a new way to make paper bags so they would not be flimsy. She sold the rights to this and started a factory.



Margaret Knight is considered one of "the female Edison", and received some 26 patents for such diverse items as a window frame and sash, machinery for cutting shoe soles, and improvements to internal combustion engines. Margaret Knight's paper bag machine made flat-bottomed paper bags that are still in use to this very day!

A few of Margaret Knight's other inventions:

- dress and skirt shield — 1883
- clasp for robes — 1884
- spit — 1885
- numbering machine — 1894
- window frame and sash — 1894
- rotary engine — 1902

Still, by 1910, inventions by women accounted for less than 1% of all patents issued in the United States. The reason for that lies mostly in women's position in the social order. During the 19th century, the idea that 'a woman's place is in the home' prevailed. Society's view of women's role limited their opportunities for a technical education or career, while laws in most states

prohibited married women from owning property in their own names. Without training or independent funds, women often had to rely on husbands to make it through the expensive business of patenting an invention — a process that included costs for model makers, draftsmen for patent drawings, patent attorneys, and the fees charged by the patent office itself. That is why Sybilla Masters, for example, saw her invention patented under a man's name, or perhaps under her own, represented only by her initials. Some women saw these options as the best way to market their inventions, knowing that prejudices against women's intellectual capabilities might thwart their work before it got into production.

Historians have looked at women inventors in the nineteenth century as a group distinct from their male counterparts. In doing so, they have examined deterrents to invention by women, the socioeconomic backgrounds of women inventors, the types and numbers of inventions, and the extent of women's involvement in invention and its consequences. These arguments fall into three broad categories: legal, economic, and social.

The legal rights of married women in the early nineteenth century were virtually non-existent. Under the common law, upon marriage a woman lost her rights, her responsibility, and even her identity. A number of historians point to married women's inability to control their own property as both a restraint to invention by women and a loophole through which women's inventions slip when patents were issued to their husbands. A married woman would hold no right, title, or power over this work of her own brain. She would possess no legal right to contract, or to license any one to use her invention. Neither, should her right be infringed, could she sue the offender. Her husband could take out the patent in his own name, sell her invention for his own sole benefit, give it away if he so chose, or refrain from using it, and for all this, she would have no remedy.

As the 19th century continued, prospects for women inventors and, indeed, women in general did brighten. In addition to legislation that changed women's status as property holders, the women's rights movement coalesced and sought equality in educational opportunities, voting and property rights, and in society as a whole. While legal status may have impeded or obscured inventions by women, economic considerations fostered the innovative process. Both market needs and the opportunity for economic growth contributed greatly to a feminine inventor's motivation. Many women inventors, however, were successful financially: 75% of the patents issued to women between 1895 and 1900 were turning a profit.

There were some attempts to categorize both the inventors and their inventions. These statements lead into the third area of historical discussion on women's inventors, namely, the definition of the status of the woman inventor within society. Examples of office inventions by urban women, agricultural inventions by rural women, educational inventions by schoolteachers, and

factory inventions by women in mill towns were marked out. This examination allows revealing a prime motivation for invention: “If a creative woman’s horizons are bounded by the household or the farmstead, then she will invent domestic or agricultural implements”.

All of the historians agree that increased educational opportunities for women in the second half of the nineteenth century were another important factor in the rise in number of inventions by women. Some statistics illustrate this rise in inventive activity. In the decade between 1855 and 1865, patents issued to women, increased 676.9% over those issued during the previous ten years. Similarly, patents issued during 1865-1875 show an increase of 566.3% over the previous decade. However, these dramatic figures come into perspective when compared with men’s totals. During 1855-1865, women received an annual average of 10.1 patents, which increased to 67.3 during 1865-1875. For the same periods, men received an annual average of 3,767.4 and 11,918.4 patents, respectively [12]. So according to the historians’ view of a picture of women inventors in the 19th century this group had faced and often overcome significant hurdles to achieve their innovative goals.

By the beginning of the last century, the social feminine status has greatly changed. Some bright and vivid pages of contemporary women inventors’ history were presented at a *Lemelson Center teachers’ workshop* in July 1999 [ibid]. *Lemelson Center for the study of Invention and Innovation* presents stories of just a few of the women who have stepped through the doors opened by their counterparts a century ago.

**Beulah Henry** (1887-1973) began sketching inventions when she was a young girl. In 1912, at age 25, she received her first patent, for an ice cream freezer. A year later, she patented a handbag and a parasol. In all, Henry earned 49 patents, the last one issued in 1970. Models of her patented inventions filled her *Hotel Victoria rooms* in New York.



A descendant of Patrick Henry, she was born in Raleigh, North Carolina, in 1887 and grew up in an artistic family — her father was an authority on art, her mother, an artist, and her brother, a songwriter. She entered university in 1909, attending *Presbyterian* and *Elizabeth Colleges* in Charlotte, North Carolina. She received a liberal arts education, since she was always honest about her lack of technical and mechanical skills. It seems she never married and lived in hotels throughout her life, spending many years, from the 1920s on, in New York City. She employed mechanics, model makers, and draftsmen to turn her descriptions of inventions into working prototypes.

Outside the workshop, her memberships in organizations like the *Museum of Natural History*, the *Audubon Society*, and the *League for Animals* hint at a love of nature and wildlife. Articles in the popular press referred to her “superb



auburn hair” and “commanding presence”. Reporters commented on her feminine grace. In addition, her upbringing among artists was reflected in her own paintings and in her desire to be a writer. She told one reporter, “I think literature and art are far above things mechanical. I have ... painted many water colors, but the world calls me an inventor”. Moreover, it is by her inventions that we remember Henry today. Their diversity and number are still impressive.

One of her most successful inventions was an umbrella with changeable, snap-on covers. The idea was that a woman could easily coordinate her parasol with her outfit. However, figuring out how to attach the covers and have them stand up to windy days was quite tricky. In fact, as Henry herself put it, “The biggest umbrella men in the country said it could not be done”. She added, “Of course, I did not believe them”. She invented a process that earned her about \$50,000 from the manufacturer and saw her umbrellas showcased in the windows of *Lord and Taylor’s*.

Another “snapping” invention was the “*Latho*” or *Dolly Dips* — a sponge that opened to hold a bar of soap and then snapped closed to keep it inside. It not only combined washcloth and soap, but also floated. The process of manufacturing the invention became a problem. Henry could not find a machine to cut the sponges correctly and therefore, she had to design one. For younger bathers, the “*Latho*” appeared in the shape of dolls.

Henry created a number of educational inventions for children, including a “*Kiddie Klock*” to teach time telling and a board game called “*Cross Country*”. Players had to traverse the country along the major railroad routes, without running into another player (which would automatically send them back to their station of departure). In the course of their journeys, youngsters familiarized themselves with the geography of the country and learned how to follow the map by train.

The brief look at Beulah Henry’s career is crowned with one more toy, which is the “*Miss Illusion*” doll. “*Miss Illusion*” had interchangeable wigs, blonde and brunette. At the push of a button, the doll’s eyes could turn from blue to brown and there was a mechanism inside it to close them. Besides that, the dress was reversible too.

When a reporter asked Beulah Henry why she was an inventor, she replied, “I invent because I cannot help it”. Her fertile imagination made her one of the most prolific women inventors of the early 20th century and earned her the nickname, “*The Lady Edison*”.

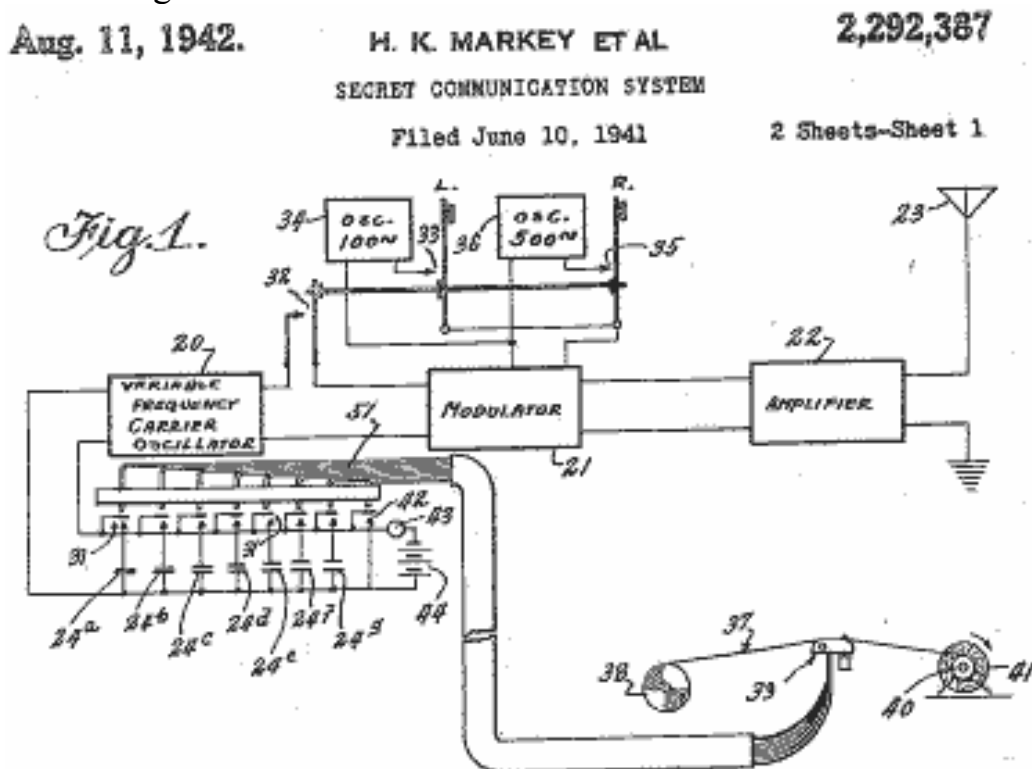
In 1913, a year after Beulah Henry received her first patent, **Hedwig Eva Maria Kiesler Markey** was born in Vienna, Austria (*died on January 19, 2000, near Orlando, Florida, U.S.*). Remembered more for her beauty than for her brains, Hedy Lamarr, an actress and communications technology innovator, once quipped, “Any girl can be glamorous. All you have to do is stand still and look stupid”.



At the age of 17, she made her first film, titled “*Money on the Street*”. Two years later, she earned notoriety for her nude romp through the woods in the Czech film, “*Ecstasy*”. She married a rich Austrian munitions dealer named Fritz Mandl and was party to his meetings on arms design. Her inventive potential became apparent in suggestions for a radio-controlled torpedo.

When Austria fell to Germany in 1938, Hedwig left her husband and her country and went to London. There, she met Louis B. Mayer, who signed her for MGM (*Metro-Goldwyn-Mayer*) and, along with a new life, gave her a new name — **Hedy Lamarr**. In 1939, she remarried, this time to writer Gene Markey.

While making films like “*Algiers*”, “*White Cargo*”, and “*Tortilla Flats*”, kept the actress busy, the inventor in her was anxious to help the war effort. She revived her radio-controlled torpedo idea in conversations with avant-garde composer George Antheil and the two of them came up with a plan to use frequency hopping to prevent jamming the signals sent to guide the torpedo. Frequency hopping means changing the frequency of a radio signal rapidly and randomly, something like what happens when you hit the ‘scan’ button on a car radio. The unpredictable changes would make it impossible to intercept the torpedo or change its course.



U.S. Patent Number 2,292,387 granted on August 11, 1942, to Hedy Keisler Markey aka Hedy Lamarr and George Antheil for a “*Secret Communications System*”.

The way the composer and the actress proposed doing this had an impact on their experience in the arts, especially on Antheil's work in electronics and music. In the 1920s, he composed a piece of music called *Ballet Mécanique* that incorporated synchronized player pianos. He believed he could adapt this concept to Lamarr's idea of frequency hopping. The transmitter they sketched out used slotted paper rolls, like those of a player piano, to send a pattern of 88 (*the number of keys on a piano*) changing frequencies. The receiver, mounted on the torpedo, would have a duplicate slotted paper roll, so it would only recognize signals that matched those sent by the transmitter. They applied for their patent six months before the United States entered the war, and received it in August 1942. The system was not used by the military during the war, but after Lamarr's patent expired, electronics were substituted for the paper rolls.

Though it was never used in wartime, this device is a component of present-day satellite and cellular phone technology. The concept of frequency hopping is being used today in electronic devices that minimize the jamming of radio signals. The technology called spread spectrum is now taken in many forms. However, the entire spread spectrum that we use today directly or indirectly flows from the invention created by Hedy Lamarr.

Hedy Lamarr was truly a movie star and an inventor. She hid a brilliant, inventive mind beneath her photogenic exterior. In 1942, at the flourishing of her Hollywood career, she patented a frequency-switching system for torpedo guidance that was two decades ahead of its time.

One more name to be remembered in connection with the electronic feeding device to help World War II amputees to feed themselves is the name of a physical therapist and inventor Bessie Blount. She was also the first African-American woman to work at *Scotland Yard* in England.

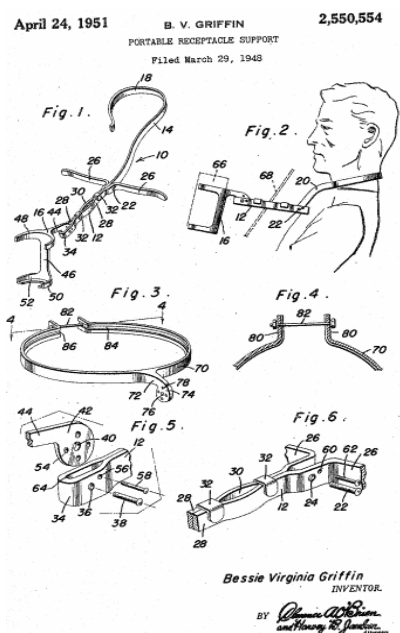


**Bessie Blount** was born in Hickory, Virginia, on November 24 1914. Details of her life are rather sketchy. She studied at *Union Junior College* and the *Panzer College of Physical Education*, both in New Jersey and continued her training as a physical therapist in Chicago. Blount used to work as a physical therapist at Theodore Edison's mother-in-law who was the son of the renowned inventor Thomas Edison. There she invented the disposable

cardboard emesis basin.

Working in veterans' hospitals Bessie Blount witnessed sufferings of soldiers who had lost their arms. It suggested her to search feasible ways of giving them more independence. She began to teach some of her patients to use their feet for doing things they once did with their hands — like typing to replace handwriting. She was deep in thought about designing some special device that would let amputees feed themselves. She sought to make life a bit better for those who had suffered traumatic injuries. In 1948, Blount (under the

name **Bessie Griffin**) applied for a patent for a “portable receptacle support” which did allow people without arms to be supplied with food without anybody’s help. It was a system with a brace around the neck to hold a bowl, dish or cup. In 1951, Blount contrived the electronic feeding gadget, later improving it by fitting around the buttocks. It was an electrical apparatus that delivered food through a tube, one bite at a time, to a mouthpiece and could be used whether a patient was sitting or lying down. Biting down on a switch signaled the machine the next mouthful. She received her patent in the same year.



By that time Blount had been a practicing physical therapist and a teacher at Bronx Hospital in New York. She tried, without success, to get the *American Veteran’s Administration* to adopt her invention. However, the institution did not accept that invention, so in 1952 she sold it to the French government.

In 1953, Bessie Blount appeared on the Philadelphia television show “*The Big Idea*”, becoming the first African-American and the first woman to be given such recognition. On the program she proudly and logically stated, “A black woman can invent something for the benefit of human mankind”.

An American chemist, a pioneer in polymer research Stephanie Kwolek also helped save lives and prevented injuries as an ultra strong and ultra thick material *Kevlar* developed by her is best known for its use in bulletproof vests.



**Stephanie Louise Kwolek** was born in 1923 in New Kensington, Pennsylvania. She had a penchant as a child for exploring the natural world with her father, collecting wildflowers and seeds for her scrapbook. She also developed an interest in technology by making clothes.

In 1942, Kwolek enrolled at the *Carnegie Institute of Technology* (now *Carnegie-Mellon University*). She majored in chemistry and minored in biology, hoping to enter medical school after earning her Bachelor’s degree. With that in mind, she took a job at *DuPont* to build savings for her further education. She never carried out that plan, though.

Kwolek’s work focused on polymers, the long, chain molecules at the base of synthetic fibers like nylon. She concentrated on finding polymers that would dissolve at low heat so they could be spun into fibers at room temperature. When she started researching extra strong and stable polymers in 1964, she turned to liquid crystal solutions in which all the molecules line up in one direction — like a string of pearls, as she often described it. Her

experiments yielded a dissimilar solution. While most polymer solutions she had ever seen were thick and clear, like syrup, this one was thin and hazy-looking. Its milky texture made the technician nervous about putting the solution into the fiber-making machine, called a spinneret. He thought there probably were solid particles that would clog up the spinneret's fine holes. However, Kwolek convinced him that the solution was safe to spin, and the resulting fibers were exceptionally strong — much stronger than steel, in fact.

Kwolek determined the solvents and polymerization conditions suitable for producing poly-m-phenylene isophthalamide, a compound that *DuPont* released in 1961 as a flame-resistant fiber with the trade name *Nomex*. She then extended her work into poly-p-benzamide and poly-p-phenylene terephthalamide, which she noted adopted highly regular rod like molecular arrangements in solution. From these two 'liquid crystal polymers' (the first ever prepared), fibers were spun that displayed unprecedented stiffness and tensile strength. Poly-p-phenylene terephthalamide was released commercially in 1971 with the trade name *Kevlar*, a fiber that finds use in high-strength tire cord, reinforced boat hulls and other structural parts, and lightweight bulletproof vests. Today, *Kevlar* is found in a range of products, from bullet-resistant vests to ropes that anchor oilrigs to the ocean floor to skis. Moreover, Stephanie Kwolek, who retired in 1986 with 17 patents to her name and was inducted into the *National Inventors Hall of Fame* in 1995, does not regret not making it to medical school.

An American nurse **Ann Moore** has never thought of herself as an inventor. Nevertheless, she mentioned that her inventive spirit is traced back to her childhood when she would create simple dolls and toys.

She was born in 1940 and grew up on a farm in Ohio. Early on, she learned about the importance of community, thinking in innovative ways, and drawing upon limited resources to create new things. There she assumed a special character and acquired skills that would serve her well working as a nurse in developing countries.

Moore specialized in pediatric nursing and taught at *Columbia University's Babies Hospital* in New York. Soon after, she worked in Germany with refugees from Eastern Europe, and then in an international work camp in Morocco, aiding victims of an earthquake. While Ann was in French language training, she fell in love with her teacher, Mike Moore. They got married and went together to work in Togo. Their partnership has included diverse experiences such as participating in the Civil Rights movement, ardent supporting of Mike's career as the director of a *Community Action Agency in the War on Poverty*, raising three daughters, singing together professionally, and founding *Air Lift*, a company that makes soft-sided carriers for oxygen canisters and high-tech instruments.





Moore's experience in Africa was the first step leading her to invent the original soft baby carrier — the so-called *Snugli* — as well as other kinds of specialized carrying cases. Moore, who taught nutrition courses in Togo, learned as much from the African mothers as they learned from her. In West Africa, she observed mothers carrying their babies securely on their backs. She admired the tight bonding between the African mother and a child, and wanted the same closeness when she returned home and had her own baby.

Ann and her husband recounted their invention story at an *Innovative Lives* program at the *Smithsonian's National Museum of African Art* in October 1999. The Snugli baby carrier has become a part of American culture. "This invention was based on an ancient concept, but at the same time it was radically different," says Moore. "This was a westernized version that fit our culture".

Today babies all over the world are being carried close to their mothers and fathers. Nevertheless, do not confuse it with the first *baby carriage* invented in 1733 by English architect **William Kent** for the third Duke of Devonshire's children!

Ann's inventive skills at creating carriers for 'precious cargo' and Mike's skill at marketing those products led them to the creation of *Air Lift*, a Colorado-based company that manufactures soft-sided carriers. The company specializes in producing carriers for oxygen cylinders. In 1986, at the request of a respiratory therapist, Ann began designing backpacks and fanny packs for carrying liquid oxygen cylinders. The packs feature mesh and air holes to safely carry the cylinders, which contain highly flammable liquid. The packs make it possible for oxygen-dependent people to hold and use their oxygen more easily — and thus allow them to walk, hike, garden, and win much more active position in life.



More recently, Moore has begun inventing carrying cases for medical and high-tech instruments. She designed a spectrometer case for *Hewlett Packard's* microwave measuring devices. Although Moore has several patents, and has even won awards for her inventions, she thinks of herself as a problem solver. "When I get engineering drawings, I just panic because it's difficult to read them. But if someone hands me an instrument, then I'm very comfortable. I ask, 'How is it going to be used? Who's going to be using it? What is the purpose of this instrument?' I don't work from drawings. I do much better with the actual instrument, to design around it. It's a trial and error process. It's all hands-on."



One of the youngest inventors just beginning her challenging rewarding career as an inventor is **Jeanie Low** of Houston, Texas. She recently entered high school; but she created her best-known invention, the *Kiddie Stool*, while she was still in kindergarten. Frustrated at not being able to reach the bathroom sink and injured her when the plastic stool she used broke, Jeanie decided to construct a stool that would be hinged to the vanity unit under the sink. Learning about an invention contest at her school, Jeanie got enthusiastic about this idea and decided to present her invention there. It goes without saying that she had won the contest!

Jeanie received U. S. Patent No. 5,094,515 in 1992 for her design. In the early 1990s, she made a number of public appearances with her *Kiddie Stool*. She gave presentations at the *Smithsonian Institution* (Washington, DC, 1993) and at national and international invention expositions, like the *Inventing New Products Exhibition*, or "INPEX" (Pittsburgh, 1994). Jeanie also began actively seeking a business partner to license and market the *Kiddie Stool*.

Since then, Jeanie has continued to invent having a strong desire to help people in different unpleasant incidents. For example, she designed and built a bathtub alarm that gives warning when the tub starts to overflow or when a small child is in danger of drowning. She has also invented a doormat with automatic brushes and easy-grip doorknobs for people suffering from arthritis.

Jeanie's younger sister Elizabeth is also an inventor. The two of them have devised the list of "Top Ten" criteria of a potential invention that include the following suggestions: it should be indispensable to life, specific, convenient, simple, and attractive.

During the last century, women have attacked stereotype after stereotype brilliantly proving out within the society. They appeared to have keen intelligence and original vision of surroundings. The only common resourceful character trait of women inventors is their genetic curiosity that continually stimulates them to search after some fresh and usually unexpected approaches to existing things. Nevertheless, a road ahead of women inventors is still rather hard and laborious as nowadays only about 10% of all patents are issued to women. Hopefully, these imaginative and ingenious women cannot but inspiring future generations of "*Ladies Edisons*".

***Dwell on the following after-text questions:***

1. What was specific about first women inventions at the end of XVIII century?
2. Who is considered the pioneer in destroying the patent pattern for men only?

3. What women's inventions were related to?
4. Do you think age influences the ability to innovate? Give some examples from the text.
5. What was government's attitude towards women's inventions?
6. Did government adopt women's inventions?
7. Was it possible for a woman to establish her own company in those years? Why?
8. What helped Mary Kies to secure her hat making process?
9. What Margaret Knight's inventions do you find the most unusual for a woman?
10. In what way in your opinion did social order influence women's activity?
11. What reasons deterred women from innovations?
12. What reasons encouraged women to innovate?
13. What do you think was the status of a woman inventor within society? Were there any hurdles for her?
14. Is it possible to say that the job of women inventors motivates their innovation? Do the working conditions depend on the feminine innovative process?
15. Do you think the role of women as an innovator has changed nowadays? In what way?
16. Give your comments upon "Ten Top" criteria of invention.
17. Do you agree, 'a woman's place is in the home'?
18. An English novelist and short-story writer Joseph Conrad once said, "*Being a woman is a terribly difficult task since it consists principally in dealing with men*". Give your comments upon this quotation.
19. Enumerate the most interesting women's inventions that impressed you mostly.

***Name these famous women inventors and give as much information as you can about their life and achievements.***





***Do you know who was:***

- The first woman inventor in America? On November 25 1715, she was awarded English Patent No. 4021 for a machine to prepare Indian corn. Although the form was issued to her husband, it clearly credited her with the invention. Her other invention was designed for weaving palmetto, chips and straw for covering hats and bonnets.
- The first American Female Patent Holder? The *Patent Act* of 1790 opened the door for any male or female to patent an invention in America. In 1809, she became the first woman to independently receive a U.S. patent for her method of weaving straw with silk.
- The prolific Inventor of the 1920's? She is responsible for 110 inventions and 49 patents in the fields of business, childcare and the home. She patented her first invention, a vacuum ice freezer, at the age of 25. Other inventions include a bobbin less sewing machine, continuously attached envelopes for mass mailings, and a form of 'photocopying' that made four copies of a document without using carbon paper. Her biggest success was an umbrella with changeable snap-on covers.

***Every innovative sphere compelled women's keen mind. They have always tried to be at the cutting edge. As one may see, there are many distinguished women inventors. Find additional material about the life and inventive activity of these individuals.***

**Grace Murray Hopper** was an American mathematician. She was the first woman to reach the rank of Admiral in the navy. She was the inventor of the computer language *COBOL* (*common-business-oriented language*), the first user-friendly business software program. She was a pioneer in developing computer technology, helping to devise the first commercial electronic computer UNIVAC I, and naval applications for COBOL.

**Marjorie Joyner** is known as the first African-American Female Patent Holder. Her indispensable invention helped women feel a lot better about themselves. She designed the dome shaped device applied electrical current to hair, allowing a hairdo to stay set for days. In 1928, Joyner was granted a patent for a machine that would "wave the hair of both white and colored people". The machine was electrically powered and had wires, cords and clamps that attached to the hair from an overhead, suspended dome. The wave machine was popular among women white and black allowing for longer-lasting wavy hairstyles.

**Mary Anderson** is remembered as the inventor of the windshield wiper. Once she took a trip to New York City in 1903. She was amazed to watch the motorman of the streetcar she was touring in kept steadily getting out. He had to wipe off the snow and ice collected on the windshield. Mary immediately made

a quick drawing in her sketchbook. The following year, she patented a device allowing drivers to manipulate a lever from the inside in order to activate a swinging arm that mechanically swept off ice and snow. This piece of equipment caught on, and by 1913 windshield wipers had become standard equipment on American cars.

*It is rather difficult to find a branch of science, which did not deserve women's attention and special feminine approach. The scope of innovation topics these women-inventors were engaged in is really tremendous.*

*Choose the one subject that revive your interest and get ready to make your own presentation.*

**Sarah Mather** — *submarine lamp* (1845)

**Jane Wells** — *baby-jumper* (1872)

**Susan Taylor Converse** — *one-piece flannel Emancipation Suit* (1875)

**Josephine Cochran** — *dishwasher* (1893)

**Harriet Tracy and Sarah Sands** — *a device for lifting and transporting invalids* (1893)

**Ellen Eglin** — *clothes wringer* (late 19<sup>th</sup> century)

**Mary Walton** — *anti-pollution devices* (late 19<sup>th</sup> century)

**Lillian Russell** — *a combination dresser-trunk* (1912)

**Katherine Blodgett** — *monomolecular coatings* (1938)

**Gertrude B. Elion** — *leukemia-fighting drug* (1954)

**Elizabeth Lee Hazen and Rachel Fuller Brown** — *nystatin* (1957)

**Julie Newmar** — *ultra-sheer, ultra-snug pantyhose* (middle 20<sup>th</sup> century)

**Frances Gabe (or Frances G. Bateson)** — *self-cleaning house* (middle 20<sup>th</sup> century)

**Barbara Askins** — *a method of enhancing the pictures using radioactive materials* (1978)

**Valerie Thomas** — *an illusion transmitter* (1980)

**Sally Fox** — *naturally colored cotton* (1982)

**Ellen Ochoa** — *an optical system which can be used to robotically manufacture goods or in robotic guiding systems* (1987)

**Patricia Billings** — *a fire resistant building material called Geobond* (1997)

**Randice-Lisa Altschul** — *the world's first disposable cell phone* (1999)

**Edith M. Flanigen** — *'molecular sieves'*

**Mary Spaeth** — *laser technology*

**Carol Wior** — *a swimsuit 'Slimsuit'* (late 20<sup>th</sup> century)

**Krysta Morlan** — *water bike, a semi-submersible, fin-propelled pedaled vehicle* (late 20<sup>th</sup> century)



## Quiz

1. Ann Moore is considered to be
  - a) the first woman inventor.
  - b) the first inventor of pyrotechnic flare.
  - c) the first inventor of original soft baby carrier.
  
2. Betsy Metcalf is known for her invention of
  - a) braiding straw method.
  - b) corn meal manufacturing.
  - c) window frame and sash.
  
3. Bessie Blount was
  - a) an English woman inventor.
  - b) an African American woman inventor.
  - c) an Irish woman inventor of ice cream freezer.
  
4. Cinematography was the sphere of interest for
  - a) Eva Kiesler.
  - b) Margaret Knight.
  - c) Beulah Henry.
  
5. *Eastern Paper Bag Company* was founded in 1870 by
  - a) Sybilla Masters.
  - b) Martha Coston.
  - c) Margaret Knight.
  
6. Electronics and music works of the composer Antheil were greatly influenced by inventive activity of
  - a) Bessie Blount.
  - b) Stephanie Kwolek.
  - c) Eva Kiesler.
  
7. Forty nine patents belong to
  - a) Stephanie Kwolek.
  - b) Margaret Knight.
  - c) Beulah Henry.
  
8. Her own company had
  - a) Ann Moore.
  - b) Jeanie Low.
  - c) Martha Coston.
  
9. *Hotel Victoria rooms* are filled with inventions of
  - a) Ann Moore.
  - b) Mary Kies.
  - c) Beulah Henry.
  
10. In 1871 Martha Coston got her patent for her inventions in
  - a) maritime industry.
  - b) military industry.
  - c) chemical industry.
  
11. In the production of *Kevlar* was involved
  - a) Stephanie Kwolek.
  - b) Eva Kiesler.
  - c) Ann Moore.
  
12. Internal combustion engine was invented by
  - a) Diesel.
  - b) Margaret Knight.
  - c) Beulah Henry.

13. Inventions in maritime industry belong to  
 a) Martha Coston.                      b) Mary Kies.                      c) Margaret Knight.
14. It was Beulah Henry who invented  
 a) *Latho*.                      b) *Sungli*.                      c) *Kiddie Stool*.
15. *Kiddie Clock, Miss Illusion, Cross Country* are the inventions of  
 a) Bessie Blount.                      b) Margaret Knight.                      c) Beulah Henry.
16. Making corn meal from maize also known as Indian meal was perfected by  
 a) Jeanie Low.                      b) Sybilla Masters.                      c) Martha Coston.
17. Margaret Knight had  
 a) forty-nine patents.                      b) twenty patents.                      c) twenty-six patents.
18. Military industry, especially making bullet-resistant vests, is due to the inventive activity of  
 a) Mary Lies.                      b) Stephanie Kwolek.                      c) Beulah Henry.
19. Parasol with changeable snap-on covers was an invention of  
 a) Jeanie Low.                      b) Martha Coston.                      c) Beulah Henry.
20. Patent for the invention "*Kiddie Stool*" in 1992 was issued to  
 a) Ann Moore.                      b) Jeanie Low.                      c) Stephanie Kwolek.
21. Patents were issued to women for their inventions in  
 a) specially designed tools and apparel.  
 b) automatic machines.  
 c) robotics and electronics.
22. Polymers which Stephanie Kwolek thoroughly investigated are used in  
 a) oil industry.                      b) clothing industry.                      c) medicine.
23. Pyrotechnical flares were adopted in  
 a) USA, Great Britain, and Russia.  
 b) Italy, Haiti and Hungary.  
 c) France, Denmark, and Netherlands.
24. Queen of Paper Bags is  
 a) Mary Kies.                      b) Martha Coston.                      c) Margaret Knight.
25. Radio-controlled torpedo with frequency hopping was the invention of  
 a) Beulah Henry.                      b) Eva Kiesler.                      c) Bessie Blount.

26. Stephanie Kwolek used to be interested in  
 a) therapy and medicine.    b) mostly chemistry.    c) arts and literature.
27. Stephanie Kwolek's major was  
 a) biology.    b) physics.    c) chemistry.
28. The first Lady Dolly Madison praised Mary Kies for  
 a) boosting nation's hat industry.  
 b) boosting nation's maritime industry.  
 c) boosting nation's food industry.
29. The first patent to women inventors was issued in  
 a) 1715.    b) 1809.    c) 1868.
30. The honoured title *female Edison* was given to  
 a) Margaret Knight.    b) Beulah Henry.    c) Stephanie Kwolek.
31. The honoured title of *Lady Edison* was given to  
 a) Stephanie Kwolek.    b) Beulah Henry.    c) Bessie Blount.
32. The idea of helping people after severe traumatic injuries was obsessed by  
 a) Hedy Lamarr.    b) Sybilla Masters.    c) Bessie Blount.
33. The patent for the ice cream freezer was given in 1937 to  
 a) Martha Coston.    b) Beulah Henry.    c) Margaret Knight.
34. Her husband gave this woman inventor the second name. The name *Hedy Lamarr* was given to  
 a) Martha Coston.    b) Sybilla Masters.    c) Eva Kiesler.
35. Working a therapist she managed to invent a special food-deliverer for sick people.  
 a) Eva Kiesler    b) Bessie Blount    c) Stephanie Kwolek

It is still a very disputable question who is superior, more talented and creative — a man or a woman. Abdu'l Bahb, Persian leader of the Baha'i faith, in a speech at the *Women's Freedom League* in London in January 1913 said that “when men bring forward as a second proof of their superiority the assertion that women have not achieved as much as men, they use poor arguments which leave history out of consideration. If they kept themselves more fully informed historically, they would know that great women have lived and achieved great things in the past and that there are many living and achieving great things today” [11]. And this struggle goes on...

Below you find the achievements of some well-known women of different periods who once were the first in some area not obligatory pertaining to inventions. Do you know these names? It is great that in this list of first women there are many Russian names!

***Read the following information and give the names of these women of great intellect.***

- Her influence through the ages has been threefold. As a Greek lyric poet of epic proportions she can deservedly be considered as the **FIRST** known woman author and the founder of women's literature. Her work influenced not only the Romans but also later poets, such as Thomas Campion, Philip Sidney, Swinburne and Ezra Pound.
- She was the **FIRST** woman inventor in America. On November 25 1715, she was issued English Patent No. 4021 for a machine to prepare Indian corn. Although the document was granted to her husband, it clearly credited her with the invention. Her other invention was for weaving palmetto, chips and straw for covering hats and bonnets.
- A Russian princess and author who was an influential patroness of the literary arts in 18th century Russia. In 1783, she became the **FIRST** President of the Russian Academy, the foundation of which she had suggested.
- She wrote the **FIRST** genuine American best-seller, *Uncle Tom's Cabin*, eliminating former Puritan prejudice against fiction as worthless entertainment. The book appeared in forty different editions and was translated into many foreign languages. Her famous novel exposed the horrors of slavery and did much to advance the cause of abolition, although she herself was not an abolitionist. In 1853, she wrote *Key to Uncle Tom's Cabin* in an attempt to show that she had relied on factual evidence. At the height of her fame, she went to England where she was well received and on her return to America wrote *Sunny Memories of Foreign Lands*. She once again returned to England and was honoured by Queen Victoria.
- She was English Queen who reigned for 63 years, the longest reign of a British monarch. Her name symbolized an epoch and during her reign, the British Empire doubled in size. She came to the throne in 1837 and in 1840 married her cousin, Albert of Saxe-Coburg Gotha and they had nine children. On April 7 1853, she became the **FIRST** Royal to use chloroform to ease the pain of childbirth. She was also the **FIRST** reigning British monarch to travel by train when on June 13 1842 she made the twenty-five minute journey from Windsor to Paddington accompanied by her husband. She also was the **FIRST** British monarch to have her photo taken when she was filmed at Balmoral in

1896. Moreover, she was the **FIRST** to use a lift and a telephone. When she died, she left behind 6 children, 40 grandchildren and 37 great-grandchildren. In 1991, a recording was unearthed at the *Science Museum* in London and it was considered her voice, which experts believe was heard at Balmoral Castle in 1888. Apparently, the Queen asked for it to be destroyed but the gramophone cylinder was kept secretly and donated to the museum in 1929.

- The **FIRST** woman to receive a German University doctorate which was awarded without examination and in absentia for her outstanding work in partial differential equations, Abelian integrals and mathematical astronomy. She was born in Moscow into an aristocratic family, studied at Saint Petersburg and was part of a movement to promote the emancipation of women in Russia. In 1889, she won a prize from the *Swedish Academy of Sciences* and was elected to membership of the *Russian Academy of Sciences*.

- A German feminist, Socialist, and Communist leader, a celebrated Marxist law reformer, pacifist and political activist who was one of the **FIRST** women to train as a teacher in Leipzig.

- She was a Russian revolutionary who advocated radical changes in traditional social customs and institutions in Russia and who later, as a Soviet diplomat, became the **FIRST** woman to serve as an accredited minister to a foreign country. This Russian woman was the **FIRST** female Head of the Legation in 1923 and in 1943 was the **FIRST** woman ambassador in the world. She came from an aristocratic Russian family but sacrificed her family and friends to the Bolsheviks. When the first Bolshevik government was set up on October 27 1917, she was appointed the **FIRST** woman Minister and became the People's Commissar for Social Welfare on November 8 1917.

- A German woman who was the **FIRST** family motorist in 1886 when she and her two sons sneaked from their family home in Mannheim one August day and took her husband's three-wheeler, with a three horse-power engine, on a 60 mile run to visit her mother. She was the wife of the man credited with inventing the car. During the drive, she was said to have to use her hatpin for carburetor cleaning and a garter for spring strengthening. Moreover, she bought fuel from a chemist, had a shoemaker repair the leather brakes, topped up the radiator with water from a spring and helped to push the single-gear, 9 mph car uphill.

- An American who was the **FIRST** woman to be allowed to work at the *Paris Observatory* and the **FIRST** woman to gain a doctorate in mathematics there. She was also the **FIRST** woman elected to the *Astronomical Society of France* and in 1898 became the **FIRST** astronomer to ascend to study the stars from a balloon. She was working in Paris at the time.

- One of the most glamorous and popular motion-picture stars of the 1920s and 1930s who is best known for her portrayals of strong-willed heroines, most of them being compellingly enigmatic. She was the **FIRST** woman to wear a pillbox hat created especially for her in 1932 by the costume designer Gilbert Adrian for the film *As You Desire Me*.

- A Russian writer awarded the **FIRST Sakharov Prize** in 1990. She was a respected novelist among a generation of Russian writers, including Boris Pasternak and Anna Akhmatova. In 1973, she wrote an open letter in defense of Andrei Sakharov who was being hounded by the secret police and the press. The following year she was prohibited from earning her living as a writer being expelled from the official *Soviet Writer's Union*.

- She was the **FIRST** prima ballerina of the USSR. She was born in Saint Petersburg and studied at the state school in Leningrad. She made her debut in 1928 and went on dancing every major classical role including Juliet, Giselle and Odette-Odile. In 1951, she was awarded the *People's Artist of the Soviet Union* and two years later was decorated with the *Order of Lenin*. She retired from dancing in 1963 and wrote several articles on dance for soviet journals.

- A Russian who was the **FIRST** woman member of the Presidium in 1956. In 1960, she became Minister of Culture even though she did not approve of modern art.

- A British actress who achieved motion picture immortality by playing two of American literature's most celebrated Southern belles, Scarlett O'Hara and Blanche Dubois. She was the **FIRST** film star to be honoured with an English Heritage blue plaque, which was unveiled outside her London flat in Eaton Square in 1996. She also was the **FIRST** British actress to win an *Oscar* for Best Actress when she received it for *Gone With The Wind* in 1939. After *Gone With The Wind*, she made only nine more films, one of which was *Streetcar Named Desire* for which she won another *Oscar* but felt that the role was in part responsible for her suffering from manic depression in her later years.

- She achieved both stardom and notoriety in the Czech film *Extase* (1932; *Ecstasy*), in which she briefly but tastefully appeared in the nude. It was the **FIRST** film in which the sexual act was depicted. The film won the *Grand Prize* at the 1934 Vienna Film festival. Under her real name, she was a technologist who, along with the composer George Antheil, invented a classified communications system especially suitable for submarines, which was patented on June 10 1941.



- In 1966, she became the **FIRST** woman Prime Minister of India. She was the daughter of Nehru and after becoming PM was responsible for many advances in India. Before becoming PM, she had held many posts in the Indian National Congress, was chairwoman of its women's department, and was a member of various advisory boards and the central Committee. She served as PM for 11 years until her defeat in 1977 by the Janata party. However, she remained one of the most powerful personalities in Indian politics until her death when members of her own Sikh Security guards assassinated her. Over 2000 Sikhs were estimated to be killed in retribution.

- She was the greatest myth figure of the modern cinema. Her photo was the **FIRST** centerfold for *Playboy Magazine* in December 1953. She became the most famous star in the world. She was a beautiful blonde goddess who is still idolized by many 40 years after her death from an overdose of pills, which is as well shrouded in mystery.

- An American **FIRST** Lady who was the **FIRST** leading social figure to short a hemline above the knee in California 1958 and prepared the **FIRST** ever guide book to the White House. Aged 31 she was the youngest **FIRST** Lady and formed the *White House Fine Arts Commission* and the *White House Historical Association* and notable works of art were returned from the National Gallery and replaced in the mansion. She was also the **FIRST** First lady to have her own press secretary.

- On February 18 1996, she became the **FIRST** actress to win the *Laurence Olivier Awards* for best actress in a Musical (*A Little Light Music*) and also best actress (*Absolute Hell*). She was also one of the **FIRST** members of the public and the **FIRST** film actress to be invited to lunch at MP's London HQ in 1998.

- A Russian woman, the **FIRST** internationally acclaimed star of gymnastics. She won more Olympic gold medals than any other competitor did. In the 1956 and 1960 Olympics, she won medals in every event on the programme, taking nine gold, five silver and three bronze ones. She had unequalled amount of 24 gold medals in Olympic, world and European championships.

- This Russian cosmonaut was the **FIRST** ever woman to go into space. On June 16 1963, she was launched in *Vostok 6* and completed 48 orbits in 71 hours. It was 20 years before another woman went into space and she was one of the first to congratulate the American Sally Ride. She worked at the *Gagarin Centre* where she trained other cosmonauts and worked on her doctorate in space technology. She was once described as one of the most powerful women in Moscow. In 1983, her portrait appeared on the one-ruble

coin. She was appointed the head of the *Soviet Women's Committee* but two years later removed from the office and became president of the *Union of Soviet Friendship Societies*. In 2000 she was named the woman of the year.

- She is the **FIRST** woman director, producer, writer, and film star with the motion picture *Yentai* in 1983. She was also the **FIRST** woman to reach the 15 million mark for a movie and was the **FIRST** female director to receive a *Life Achievement Award* from the *American Film Institute* in November 2000.

- This Russian cosmonaut was the **FIRST** woman to walk in space on June 25 1984. In 1982, she became the **FIRST** woman to make two space flights having first visited the *Salyut-7*. She was born in Moscow, trained there as a pilot and then became a flying instructor. In 1970, she won the world aerobatics championships. Six years later, she was qualified as a test pilot. She established 18 world aviation records. She was the second woman to fly in space.

- In 1995, she was the **FIRST** woman to pilot a space shuttle *Discovery* when it went into orbit. The craft was due to rendezvous with the Russian space station *Mir* and carried the **FIRST** Briton to walk in space, Dr Michael Foale. Four years later, she was the **FIRST** woman to lead a US space flight.

- Talk show Queen who was the **FIRST** black woman to own a large television studio, **FIRST** woman to own and produce her own talk show and the **FIRST** black female co-anchorperson on the evening news in Nashville. Her Show won three *Emmy Awards* when aired nationally and then later won a further five *Emmy's* and four *NAACP Image Awards*. For her acting debut in *The Color Purple*, she was nominated for an *Academy Award*. In 1993, she was the **FIRST** woman to top *Forbes* magazine's annual list of showbiz millionaires and in 2002; she was the **FIRST** black woman to be on *Forbes* magazine's list of billionaires.

- Born on November 14 1954, she was the **FIRST** woman national security adviser to a U.S president and in 2004 became the **FIRST** black woman Secretary of State in America.

- An American comedian, actress, and producer who is known for her work in theatre, film, television, and recordings. An accomplished performer with a wide repertoire, her work ranges from dramatic leading roles to controversial comedic performances. She was the **FIRST** woman to receive the *Mark Twain Prize* for American Humour in October 2001.

- The wife of the legendary *Beatle* John Lennon and the **FIRST** woman to read philosophy at Tokyo's Gakushuin University.

- An American singer, songwriter, actress, and entrepreneur whose immense popularity in the 1980s and 1990s allowed her to achieve levels of power and control unprecedented for a woman in the entertainment industry. She was born in 1958. Her website is the **FIRST** ever to launch an on-line mobile phone shop, making it possible for ring-tones and screensavers to be downloaded.

- The **FIRST** woman in modern times to be awarded the *Freedom of the City of Portsmouth* — 1992 and in 1995 was the **FIRST** Royal in the 20th century to take the press to court.

- An American singer and actress whose first four albums, released between 1985 and 1992, amassed global sales in excess of 86 million copies. She was the **FIRST** female artist to enter the album charts at No 1 in 1987 with her second album. She has sold over 100 million records in virtually every country in the world. In 1994, she won three *Grammy Awards*, bringing her total to five. She also has 21 *American Music Awards*, 11 *Image Awards*, 5 *People's Choice Awards*, 2 *Emmys* and 6 *Soul Train Awards*. In November 1995, she was inducted into the *Hall of Fame of Great Americans*.

- The **FIRST** actress to win four of Australia's *TV Logie Awards*.

- She was the **FIRST** Soviet leader's spouse to visit a private American home when she accepted an invitation to visit the home of Pamela Churchill Harriman in 1988. Pamela Harriman later became US Ambassador to France.

- In January 1996, she was the **FIRST** First Lady in America to appear before the Federal Grand Jury and in February 2000, she became the **FIRST** president's wife to run for office when she launched her senate campaign in New York. In September 2000, she became the **FIRST** First Lady to be elected to the US government when she won a Senate seat in New York State on November 6 2000. She was also the **FIRST** woman partner at the *Rose Law Firm* in Little Rock, Arkansas and later was the **FIRST** First Lady to be a lead witness on a major administration legislative initiative when she appeared before the *House Ways and Means Committee* on September 28 1993. She was also the **FIRST** First Lady to deliver a televised primetime address at a national political convention although Eleanor Roosevelt was the **FIRST** to address a national political convention (not televised at this stage).

- Britain’s **FIRST** female inventor of the year in 1998 when she designed a talking potty.

- The **FIRST** Russian woman to become *Miss Universe* crowned in 2002. Afterwards, for the **FIRST** time in the history of the competition the crown passed to the runner-up as she found that she could not carry out her engagements as required.

- She was the eldest daughter of Queen Victoria. With her husband Frederick, the Crown Prince of Russia, they were the **FIRST** newly wedded couple to appear to the crowds on the balcony of Buckingham Palace. Mendelssohn’s “*Wedding March*” was **FIRST** played at their wedding.

Unit 11

### TOP 25 INNOVATIONS OF THE LAST QUARTER CENTURY

*“Industry is the soul of business and the keystone of prosperity.”*  
Charles Dickens (1812-1870)

Here is the list of 25 top innovations of the last quarter century created by a group of American experts [21] according to voting results in 2005. In creating this list, the group hoped to single out “*25 non-medically related technological innovations that have become widely used since 1980. They are readily recognizable by most Americans, have had a direct and perceptible impact on our everyday lives and/or could dramatically affect our lives in the future.*”

These 25 top innovations are easily identifiable by not only Americans but also every nationality. We all are familiar with them, as all this up-to-date technology has become customary and conventional in our modern life. Now it is rather difficult if not impossible to imagine the absence of at least one of the mentioned below items. Look through this list and appreciate not so much its enduring value as the valiant efforts for creating and introducing them.

|                                                            |                                                  |
|------------------------------------------------------------|--------------------------------------------------|
| 1. The internet                                            | 14. ATM ( <i>Automatic Teller Machine</i> )      |
| 2. Cell phone                                              | 15. Advanced batteries                           |
| 3. Personal computers                                      | 16. Hybrid car                                   |
| 4. Fiber optics                                            | 17. OLED ( <i>organic light-emitting diode</i> ) |
| 5. E-mail                                                  | 18. Display panels                               |
| 6. Commercialized GPS ( <i>Global Positioning System</i> ) | 19. HDTV ( <i>High Definition Television</i> )   |
| 7. Portable computers                                      | 20. Space shuttle                                |

|                                                    |                                       |
|----------------------------------------------------|---------------------------------------|
| 8. Memory storage discs                            | 21. Nanotechnology                    |
| 9. Consumer level digital camera                   | 22. Flash memory                      |
| 10. Radio frequency ID tags                        | 23. Voice mail                        |
| 11. MEMS ( <i>microelectromechanical systems</i> ) | 24. Modern hearing aids               |
| 12. DNA fingerprinting                             | 25. Short range, High Frequency Radio |
| 13. Air bags                                       |                                       |

One would not be surprised at the fact that the *Internet* (as we know it) headlines the top 25 innovations of the past quarter century. Like the *Internet*, other items of the top 25 list have greatly changed the habitual way of life and are so commonplace that are taken for granted. For example, for many people it is rather a trivial and ordinary thing to turn off their PCs (*No 3*), HDTV's (*No 19*) or plasma screen TVs (*No 18*) or to grab their cell phones (*No 2*) and laptop computers (*No 7*) before they leave their homes.

*We never set ourselves the task of naming the inventors of customaries we use. Below you may find some interesting facts about the above-mentioned items originators as well as brief information on several other unique but well known things of nowadays and the dates of their discoveries.*

- The widest use of tin is in the *tin can*. In 1810, a Frenchman called **Nicholas Appert** won a prize from Napoleon Bonaparte for finding a way of preserving food for his troops when they went to war. However, the first patent for making a tin can was issued to a British inventor, **Peter Durand**, in 1810.

- The inventor **Samuel Slocum** patented the first *stapler* on September 30, 1841.

- Native American **George Crum** invented *Potato chips* in 1853.

- In the early 1880s, the first commercial coin-operated *vending machines* made their appearance in London, England. Those vending machines could only dispense post cards. In 1888, the *Thomas Adams Gum Co.* introduced the first vending machines to the United States. The machines installed on the elevated subway platforms in New York City sold Tutti-Frutti gum.

- On January 3, 1888, the drinking straw was patented by **Marvin Stone**.

- The *teabag* was first used by New York tea wholesaler **Thomas Sullivan**, who silk-wrapped samples of tea to customers in 1908.

- In 1928, **Thomas Midgley, Jr.** and **Charles Kettering** invented a “*Miracle Compound*” called *Freon*. Freon is now infamous for its role in the depletion of the earth’s ozone layer.

- *Cigarette lighters* became popular after the 1932 invention of the *Zippo* lighter by **George G. Blaisdell**.

- *Polyurethanes* are the basis of a novel type of elastomeric fiber known generically as *spandex*, segmented polyurethane. It is an elastomeric fabricated fiber (*able to stretch at least 100% and snap back like natural rubber*). **William Hanford** and **Donald Holmes** co-invented *polyurethane* in 1942. *Spandex* was invented in the late 1950s. It was a replacement material for the rubber in women's foundation garments. The first commercial production of spandex fiber in the United States was in 1959 by *E. I. du Pont de Nemours & Company, Inc.*

- The first patent for *bar code* was issued to inventors **Joseph Woodland** and **Bernard Silver** on October 7, 1952.

- In 1954, inventors **Gerald Pearson**, **Calvin Fuller**, and **Daryl Chapin** created an array of several strips of silicon (each about the size of a razor blade), placed them in sunlight, captured the free electrons and turned them into electrical current. This was the first *solar battery*.

- What we commonly call *styrofoam*, is actually the most recognizable form of foam polystyrene packaging. *Styrofoam* is a *Dow Chemical Co.* trademarked form of polystyrene foam insulation, introduced in the U.S. in 1954. *Styrofoam* is a trademarked name; the real name of the product is foamed polystyrene. **Ray McIntire** invented *Styrofoam* for the *Dow Chemical Co.* McIntire said his invention of foamed polystyrene was accidental. His invention came as he was trying to find a flexible electrical insulator in the early 1940s. Polystyrene, which already had been invented, was a good insulator but too brittle. McIntire tried to make a new rubber-like polymer by combining styrene with isobutylene, a volatile liquid, under pressure. The result was foam polystyrene with bubble, 30 times lighter than regular polystyrene.

- The onset of *Internet* is related to the mid 1960s.

- Mathematicians **John Kemeny** and **Tom Kurtz** developed *Beginner's All Purpose Instruction Code* or BASIC in 1963 at *Dartmouth College*.

- In 1968, **Roy Jacuzzi** invented and marketed the first self-contained, fully integrated whirlpool bath by incorporating jets into the sides of the tub. *Jacuzzi* is the trademarked name for the invention.

- The term '*personal computer*' (PC) originates from IBM PC manufactured in 1981 by IBM Corporation.

- The first operational flight of *space shuttle* occurred in 1982.

- An American scientist **K. Eric Drexler** in 1985 became one of the foremost advocates of *nanotechnology* that is a branch of technology dealing with the manufacture of objects with dimensions of less than 100 nanometres and the manipulation of individual molecules and atoms.

- **Tim Berners-Lee** invented the *World Wide Web*, HTML (*hypertext markup language*), HTTP (*Hypertext Transfer Protocol*) and URLs (*Universal Resource Locators*) in 1990. In the complex history of innovation flowing to and

from the Internet, one major achievement is uncontested: in 1989-91, Tim Berners-Lee invented the World Wide Web.

- GPS or the *Global Positioning System* was invented by the *U.S. Department of Defense*. It cost \$12 billion (USD).

### **Future innovation**

*Microsoft Research Web Page* [22] presents information about “*Towards 2020 Science*” which is of great interest. In the summer of 2005, an international expert group got together for a workshop to define and produce a new vision and plan for expansion, challenges and potential of computer science and computing in scientific research in the next fifteen years. The resulting document, “*Towards 2020 Science*”, sets out the priorities, complications and opportunities arising from the increasing coalescence of computing and the sciences. The authors proclaimed the main objective of the document “*Towards 2020 Science*” to be a ‘pathfinder’ to new research interactions between sciences and computing. According to the authors’ opinion, a scientific revolution is just beginning. It does have a strong potential to create an era of science-based innovation that could completely outshine the last half century of technology-based innovation. Becoming a lot superior in achievements and excellence it will generate a new wave of unprecedented global social, technological and economic growth.

*WAP, broadband, Wi-Fi, 3G* — all these are the latest technological advances for the Internet. Phone technology and the Internet change so rapidly that we barely have time to get used to one new concept before it is immediately replaced by another and becomes outdated. Broadband is a combination of the latest cable and radio technology. It means that huge amounts of electronic data can now be transmitted from computer to computer at incredibly high speeds. It’s like changing from a narrow pipe delivering your water to a much broader pipe. It has some benefits for the user. Broadband is much faster, more reliable Internet connection; it’s turned on all the time (you pay a fixed sum every month, so you don’t have to keep dialing up); you can do two Internet operations at the same time (e. g., connect e-mails and download a picture from the Internet).

Computing without phone lines, similar to cordless phone technology is called wireless. Its benefits for the user are as follows: the freedom to use a laptop or notebook without connecting it to a phone line (as long as you don’t go too far away from the wireless hub — the main unit of the network that is connected to a phone line).

3G stands for “third generation” mobile technology (still in development) that will be able to transmit data quickly to your phone. It allows access to the complete, real Internet (not the mobile-only WAP network) quickly and in colour over your mobile. It also provides the ability to download music and video to your mobile.

Be prepared! In some two or three years you'll wonder how we ever managed without these Internet innovations!

*Here is the description of one more new technology made by Clive Thompson [29, p.124-5].*

### **War-Chalking**

Back in the Depression, hobos would draw chalk marks on the walls of houses to show where a generous stranger lived. A top hat meant '*kind gentleman lives here*'; a cross meant '*religious talk will get you a meal*'.

This summer, the British designer Matt Jones created a new set of hobo symbols for the Internet age. Jones is a fan of Wi-Fi, the new technology that lets you take your broadband connection and broadcast it around your home or office. Wi-Fi signals can travel more than 1,000 feet, which means that your private connection often leaks out into the street. If you're feeling generous, you can leave it "open" for anyone passing by to use... Presto: free high-speed access!

The only problem is that Wi-Fi radio signals are invisible. You might be near a node right now. But how can you tell? Easy. You look for one of Jones's symbols scrawled on the wall. If you see two back-to-back half-circles, it means some geek has discovered an open node nearby...

Within weeks of Jones's invention, war-chalking ... took off. The *Schlotzsky's Deli chain* began war-chalking its restaurants and the state of Utah announced it would mark up its conference rooms. Wireless companies, in contrast, reacted with alarm: Nokia called war-chalking "theft, plain and simple", and some cable companies have sent warning letters to users who openly share their Internet connections.

Yet the growth of Wi-Fi seems unstoppable. ...Consider it a lesson from the hobos: in a world full of generous strangers, sometimes there really is such a thing as a free lunch.

#### ***Answer the questions dwelling upon the mentioned problems.***

1. What do you know about the Great Depression of the early 1930s?
2. Why do you think hobos left chalk marks on houses during that time? Who were those chalk marks addressed to?
3. What is "wireless fidelity"?
4. Interpret on the phrase "*your private connection often leaks out into the street*". What does it mean?
5. Do you agree that the invisibility of Wi-Fi signals is "the only problem" with them?
6. What helps you to discover a free Wi-Fi connection?
7. Why do you think the war-chalking phenomenon took off among some commercial establishments?



8. What was the reaction of telecommunications companies to this event?
9. In your opinion, does the author of the article approve of free Wi-Fi growth? Do you consider free Wi-Fi signals as an act of charity?

The life has proven not once that there is nothing magical or supernatural about innovation. Anyone can make himself a modernizer and start to innovate. What is an innovator? After familiarizing oneself with long and exciting Odyssey of fertile multinational minds, it is quite possible to formulate the main characteristics of such a pioneering and inventive person. An innovator is called someone who:

- has bright extraordinary ideas and energetically takes some enthusiastic measures about them,
- hunts for every opportunity to introduce and promote his ideas,
- thrives on the challenge of having his own scientific breakthrough,
- makes money out of having solved formulated problems and selling his ideas,
- eventually as a rule starts up his own business.

Besides, never forget that necessity is the mother of any invention! Whenever there is a desperate shortage in something, each time a new area of innovation inevitably opens.

There are great many examples when innovative activity of a would-be illustrious creator starts in his or her childhood. Children proved to be rather keen-witted and shrewd creatures. Being sincere and frank by nature, they are supportive, careful and attentive to other people's needs. The innovative history knows many of children's groundbreaking inventions that appeared rather necessary [23].

**Brandon Whale** is one of such extraordinary young innovators. At the age of nine, Brandon visited a children's hospital and thought that it would be of great help to have a comforting toy for kids who were receiving injections or getting blood drawn. To avoid this serious problem of kids' crying, Brandon devised a soft, cheerful hand-held stress toy that distracted, calmed and eased the pain of the child. Besides, it facilitated the medical procedure of injections administration. His first squeezable toy was the lovable colourful ladybug. His



*Needle Beetle* has become a real child's 'tranquilizer' in a frightening stark hospital room. Moreover, this invention has double functions: physiological one as its pumping stimulates the blood flow in the vein and psychological function because it soothes the child.

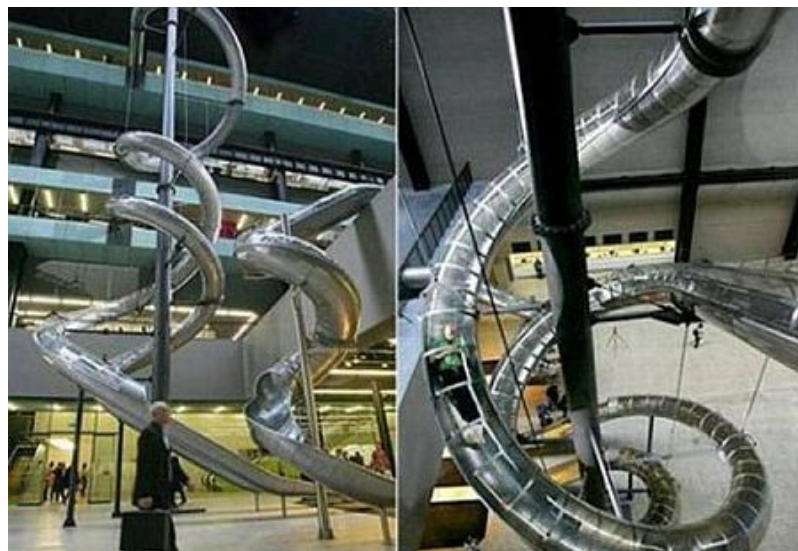
**Chandler Macocha** was just twelve years old when he saw his neighbor in a wheelchair. The girl was struggling to get her belongings out of her pack hanging on the back of her

wheelchair. Chandler devised a special *Wheelchair Backpack*. This exceptional device aids wheelchair bound people to rather easily use their backpack or bag from behind their wheelchair. This innovation brings a sense of independence and control into the life of people completely dependent on a chair as well as lightens the burden of their surroundings.



**Spencer Whale** at the age of six realized that kids hospitalized with serious health conditions still liked to play. However, the use of medical apparatus (both intravenous and oxygen) often inhibited their freedom. He also paid attention to such a problem that parents would always nervously look after their children with the IV pole, as they are afraid that the needle would fall out. Therefore, Spencer invented a ride-on vehicle called the *Kid Care Car* with an attached IV pole. In this way, kids can have the relative freedom of actions and even play while getting their injections. In the meanwhile, their parents can rest their minds from fear that the needle can drop out by chance.

Another unorthodox invention is the huge pipelines proposed instead of typical way of walking down the steps. These sliders are proposed as a substitute for the elevators. The creator is sure that sliding down such a pipe one can move as quick as a Laplander's sledge. No matter how vanguard and adventurous these sliders are, it seems much more reasonable to keep some other normal human being option in the building. One will easily make himself dirty and crumpled rolling down the slider. Otherwise, there should be anticipated a special cabin or at least a folding chair for keeping oneself as neat as a pin while sliding. Besides, immediately appears quite the opposite problem — who will be able to go up with the help of such a slider?



*Forget the Elevators and Take the Sliders!*

And now let us speak of some rather futuristic novelties. You can judge them as weird and strange inventions but what if in the nearest future they appear to come true?

***What do you know about your senses? Which of them is the mostly developed in you? What do you think of the idea of one's reacting to ambient conditions with the help of the tongue?***

In order to make people's organs of sense more receptive to the environment a special army helmet was developed. This gadget looks like the newest tool on the high-tech battlefield. Its function is not to supply the military with genetically enhanced strength or uncanny resistance to pain, but rather, heighten sensitivity in their tongues. This device, known as the *Brain Port*, is designed to route signals from helmet-mounted cameras and sonar to the tongue. The idea is that in such a way *Navy SEALs* and *Army Rangers* will have in addition one more, extra "sixth sense" that allows them to perceive things and events going on around them without visual signs. It may be possible that in a few hundred years from now the human race will have developed an intrinsic ability to be aware of danger, pain or unpleasant touch sensations through tingling in the taste buds. Who knows which of the existing five senses will be of greatest necessity to a human being in future?



The next original idea concerns hot dogs selling on the highway. There is always a Wienerwurst lover in every company. From time to time driving somewhere one may come across the problem where to have a snack. **Max Burton** offers hurrying and starving people his wonderful *Hot Dog To Go*. When they just cannot find a street vendor to buy a hot dog, they should use this widget. This necessary little gadget can cook up to six hot dogs at one time, all while heating up two buns simultaneously. It plugs into the 12-volt cigarette adapter in your car or boat, and has three settings: *Steaming*, *Warming* and *Both*. Using such a device one will never have to worry about being hungry and can quietly arrive in his point of destination.

People always dream. They have always wanted to open the secrets of nature. They are always ready to travel and explore *terra incognita*. However, the bravest dreamer cannot imagine teleportation across the world to be possible. Anyway, scientists in Denmark have managed to teleport both light and actual





matter across a distance of half a meter. In the experiment they sent a “*macroscopic atomic object containing thousands of billions of atoms*” within a split second. It is still too early to state that they can transport an actual human being, but it is the first indication that teleportation may actually be possible. Of more immediate interest is the fact that this also opens up possibilities for quantum computing

widening current computational limits. Well, as long as someone out there knows what he is doing, everybody will have a feeling the future is going to be extraordinary interesting.

One more little gizmo called *The Popularity Dialer* was contrived for those who have problems with good excuses of leaving boring parties. This brilliant web app will automatically call your cell phone at the time you have chosen. It even plays a pre-recorded message to help you along with your fake conversation. You will never have to trouble about how to slip away from dull and tedious parties again. It may appear ideal for blind dates as well. It is quite possible that our enterprising students will find many other situations for using this gizmo.



According to *The Daily Mail*, a new device from *Toshiba* allows the wearer to see a full 360-degree immersive view on a dome-shaped screen. In this case, virtuality becomes reality! One can only assume that it is a joke, considering that it would probably also require an oxygen tank to use safely.



## STRANGE BUT TRUE INVENTIONS

*Read about the real inventions and innovations below [6]. What is your opinion of each one? Give your comments and arguments.*

1. A Zimbabwean inventor came to the idea of a collapsible coffin. Its ability to be made up of different parts allows carrying it on the bus without any problems.

2. An American originator brought forward extraordinary properties of usual toothpaste. In his opinion, this paste for cleaning the teeth will make them glow-in-the-dark. This phenomenon may appear of great importance as a road safety aid.

3. An American *Washington design* firm has proposed an extravagant way of appearing themselves aboard to *Economy Class* passengers. They could be delivered to the aircraft side in specially designed pressurized containers fixed in the holds of jets.

4. Japanese have worked up uncommon rocks for strong drinks. These rocks possess a unique characteristic to produce the sound of a loud crackling because of the strength of one's alcohol. The stronger the drink, the louder rocks crackling is.

5. Michigan scientists introduced chocolate shock absorbers for a traveling vehicle. Their innovation can easily reduce profound harmful effects of bumpy roads on cars because the chocolate becomes a gel when electrified.

6. The developed by two scientists from Illinois leash without any pet can mew or bark, depending on your personal affection towards animals. Having this original leash, you may go for a walk with a non-existent cat or dog.

7. The laser shaver, invented by Frenchman **Eugene Politzer**, allows to get rid of wiry bristle by burning it rather than cutting.

8. The self-extinguishing cigarette, devised by Danish inventor **Kaj Jensen**, has a special container of water buried somewhere near the filter tip.

Among millions of various patents issued in different countries, there are bound to be a few inventions that make people scratch their heads in wonder.

*Familiarize yourself with some other extravagant and original examples of such gadgets [24].*

*Have a close and penetrating look at them and give your criticism.*

*Share your opinion with the audience whether you are willing to have something like them.*



*Describe each innovation. What in your opinion were the reasons of inventing them all? Aren't you surprised that all inventions are patented? What do you think is their main functions? What are their advantages and disadvantages?*

***How do you like these novelties? Which of them do you find necessary in household? Which of these would you like to have?***

***Look through the list of some other actual patented inventions.***

- *Bird Diaper* — those who have birds know that it is necessary to clean their cage that is far from being enjoyable. Whenever it is the time to do this tiresome job, take this novel diaper and easily change the parakeet.

- *Composition for Attracting Flies* — bothersome ubiquitous flies are very annoying. This peculiar composition is intended to attract flies, as they are not very picky. As soon as they gather, one should be rather quick to get rid of them all.

- *Dad Saddle* — a saddle is necessary if one wants to go horse riding. This device is specially intended for fathers who cannot turn down their children's request to "ride horsey" on the dad's back. Do you think the kid will feel comfortable in such a saddle? And what about his father?

- *Dining Table Dishwasher* — everybody knows what a boring thing is to wash up especially after great parties. It is rather difficult to find a volunteer for such a job. However not in vain they say 'where there is a will, there is a way'! With the help of this invention, the only thing to do as soon as the dinner is over is just to open the table and put the dishes in!

- *Dog Dust Cover* — those who have dogs know what a problem is to keep one's pet from making itself dirty. This amazing dust cover prevents the dog's owner from scrubbing and vacuuming his pet!

- *Flying Chicken Plane* — what should you say about traveling on a plane in the shape of a giant chicken? Can you imagine its sounds while taking off? Do you think anyone should like it?

- *Poodle Earrings* — this decoration is developed for dogs-fanciers who try to be stylish and elegant themselves. Moreover, they should not ignore the attractiveness in their pets. Due to these earrings, a dog will also look classy and be a match for its master.

- *Santa Detector* — the most favourite holiday New Year makes an inventor's mind work hard. This detector is just a stocking for parents to put their presents into it. It has a particular alarm device that loudly sounds when the stocking is full of New Year gifts.

- *Sneaker with Hoop* — these footwear is designed for true basketball-lovers. Just imagine that each sneaker has a tiny basketball hoop on the back!

Every time you miss the beloved game, it is possible to find a little stone and start playing either alone or with your friend.

- *Talking Dog Collar* — another original invention for dogs' owners supposing their pets can talk to them. The dog's collar is supplied with a set of recorded messages, and there is an illusion that your dog is talking to you!

***Do you agree that all these inventions deserve to have been patented? Are they indeed rather essential for human beings? Which of the inventions do you find amusing? Which of them are funny and may be received as outright and lavish gifts for your friends?***

### **Odd museums**

Our world appears to be rather friendly to some extraordinary inventions and gadgets. In order many people can observe all these original contrivances themselves and judge upon their benefits very exciting museums are organized in several places of the world. Would you like to visit some of them?

*Banana Museum* (Altadena, California) that demonstrates such items as a petrified banana and a banana phone. It also has a banana club with over 9000 members.

***Can you imagine a banana phone? Where in your opinion can it be of great necessity? Which phone would you prefer — flip-flop or a banana one?***

*Phosphate Museum* in Mulberry, Florida, apparently, may be called the phosphate capitol of the world. Who knows?

***Is Florida so rich in phosphate to be considered itself the phosphate capitol of the world?***

*Museum of Bad Art* (Dedham, Massachusetts).

***What do you understand by 'bad art'? What displays could be exhibited there? Which innovations would you consider as museum pieces there?***

*Carhenge* museum in Alliance, Nebraska is just like *Stonehenge*, but with gray-painted cars instead of stones.

***What is Stonehenge? Where is it located? What is it famous for? What parallels in your opinion could there be with cars? What do you think about cars' colour?***

*Cockroach Hall of Fame* (Plano, Texas) bears a strong resemblance to the *Hall of Fame of Great Americans* founded in 1900 at the *City University* of New York. Was it erected just in case you wanted to see dead roaches dressed in costumes?



*Give your comments upon the name of the museum. What is a roach? Where do they exist? Why do you think they are in costumes? What do you think about parallelism in naming?*

*Which of these unique museums impressed you mostly?*

*What contrivances is it possible to exhibit in some of these specific museums?*

*Which of inventions you are familiar now with 'deserve' to your mind to appear there?*

## FINAL TEST

### A. Complete the sentences using all the scope of the material.

1. ... accomplishes the task of developing an element of novelty.
2. ... are the two favourite candidates for the ultimate source of the process of innovation.
3. ... has been a worldwide phenomenon.
4. ... together produced a society ripe for an industrial revolution based on technological innovation.
5. Abraham Lincoln held a patent. He invented ...
6. According to the theory of ... the technology development was influenced by social need.
7. According to the theory of diffusionists all innovation has moved westward from...
8. Al-Razi established the firm foundations of the laboratory in the modern sense, designing, describing and using ...
9. As a starting point for innovation, one needs ...
10. Business organizations spend ... on innovation.
11. Chemical problems require ...
12. Ernst Richard R. won the ... for Chemistry for his development of techniques for ...
13. Every effective presentation should have ...
14. Great importance in the history of technology concerns with the notion ...
15. In order to complete the entire mentioned goals one should follow ...
16. In order to protect your invention you should take some measures to ... it.
17. Innovations that fail have often been rejected or "shelved" due to ...
18. Jabir Ibn Hayyan perfected chemical processes such as ...
19. Many independent civilizations had previously developed different ...
20. Much attention is now given to formal research and development for ...
21. Necessity is the ... of invention.
22. Nicholson William is the discoverer of ...
23. Robert Boyle is more commonly recognized as the ...

24. Robert Boyle is noted for his pioneering experiments on the properties of ...
25. Technology in the ancient world is characterized by the first giant step of ...
26. The development of new marketing methods with improvement in product design or packaging, product promotion or pricing is ...
27. The history of ... is thus largely the story of the preservation, recovery, and modification of earlier achievements.
28. The Industrial Revolution occurred first in ..., and its effects spread only gradually to continental Europe and North America.
29. The main objective of a presentation is ...
30. The main section of a presentation contains...
31. The main skills for a man to survive concerned his abilities for...
32. The occurrence of time lags — the inevitable delays between ... — provides another reason for expecting cyclical fluctuations to occur in any economic process.
33. The often unspoken goal of innovation is to ...
34. The possession of full documentary records on invention is issued with the help of ...
35. The technology of the ... was superior to that of the Romans.
36. The two key inventions of the Middle Ages are ...
37. Until as recently as the 17th century, ... were considered authorities in several sciences.

**B. Agree or disagree with the following statements.**

1. "...if she wants to get to the top, a woman must be prepared to work 90% harder than a man" (Margery Hurst).
2. All inventions are always important and necessary.
3. An inventor always has to work in emptiness alone.
4. Compounds consisting of carbon fully bonded to chlorine and fluorine, called chlorofluorocarbons, were ideal for their intended use when they were first discovered.
5. Daniell John Frederic invented a *hydrometer* (an instrument for measuring the density of liquids) in 1790.
6. Davy Edward is best known for his development of a commercially viable ammonia-soda process for producing soda ash (*sodium carbonate*), widely used in the manufacture of such products as glass and soap.
7. Failures of innovation should be identified and screened out as early in the process as possible.
8. Greece is one of the two favorites for the long-established civilizations of the ancient world.
9. In the Middle Ages, there were no records about inventions.

10. Innovation is the process that transfers saleable goods, processes and services through business activity into ideas.
11. Innovations were introduced to Eastern Europe from Western Europe.
12. Internet appeared at the beginning of the last century.
13. It is equally possible that the technical innovations themselves have been dictated by the prior needs of the economy.
14. It is not a problem to decide whether some innovation is spontaneous or transmitted one by undiscovered route.
15. It is rather difficult to invent.
16. It is very simple to explain in what way eastern European innovations influenced Western Europe.
17. It was John Dalton who first defined chemical combinations as a union of the elements together.
18. Lee Yuan T. received the *Nobel Prize* for Chemistry in 1986 for his role in the development of *chemical-reaction dynamics*.
19. Mary Kies is known as patenting pioneer.
20. Most of the goals could apply to only some types of organizations; it depends whether it is a manufacturing facility, marketing firm, hospital or local government.
21. Much of the innovative process involved recovering the knowledge and achievements of the ancient world.
22. Not all organizations can innovate.
23. Patents are never granted to new plant or animal forms developed through genetic engineering.
24. Presentation itself is more important than its performance.
25. Progress in chemistry is due to the inquisitive minds and searching looks of distinguished scientists all over the world in different periods.
26. Silk working is the western world innovation.
27. Solvay Ernest won the *Nobel Prize* for Chemistry in 1926 for his studies in the chemistry of colloids and for his invention of the ultracentrifuge.
28. Styrofoam is a trademarked form of polystyrene foam insulation.
29. Technology in the ancient world was due to the attentive observations of people.
30. The first position in the list of top 25 innovations takes cell phone.
31. The first stapler was invented at the beginning of the last century.
32. The first teabags were paper-wrapped.
33. The first vending machines were introduced in America.
34. The image of the speaker at a presentation is of no importance.
35. The list of top 25 innovations contains medically related technological inventions.
36. The more radical and revolutionary innovations tend to emerge from practice while more incremental innovations may emerge from R&D.

37. The six-stroke engine, the torpedo, soundproof windows, the super efficient solar cell and more are all American inventions.
38. The windmill and gunpowder were developed due to the social need.
39. There are only three significant elements of effective presentation.
40. There is a lot of information about technological advances of the Middle Ages.
41. Western civilization was always source of bright ideas and inspiration for the east.

## Appendix

### **HOW CREATIVE YOU ARE?**

There is no laundry list of characteristics that describes a creative thinker. But the latest research identifies some common traits.

1. Creative types are generally highly motivated, independent, and persistent. They are also risk-takers, great skeptics, iconoclasts but have a strong sense of humour.
2. Creative people are often hard to get along with.
3. Hunches, instincts and emotions play big roles in their decision-making.
4. They prefer the complex and asymmetrical — in objects as well as in intellectual tasks.
- 5, 6. Disorder does not make them anxious; indeed, they relish it.
7. Creative people usually do not have a dull, predictable childhood. Instead, childhood is marked by exposure to diversity. Parents show greater-than-average cultural and intellectual interests and grant their offspring unusual freedom in exploring and making decisions. Strains in family life — financial ups and downs or divorces — are common. Experts believe a dose of adversity gives children the ability to see issues and problems from different points of view.
8. Forget the old stereotype of the creative genius as a loner. The most gifted creators are veritable gadabouts.
9. They constantly exchange ideas with colleagues at the cutting edge of their fields. Studies have shown that experts who talk most with their peers hold more patents, publish more papers, and produce more innovative work than their more aloof colleagues.

10. Creative problem solving draws on everything from knowledge, logic, imagination, and intuition to the ability to see connections and distinctions between ideas and things.

11. To dislodge the blocks to creative impulses, it is advisable to ask ‘what if’ questions that force you to use your imagination to remove obstacles to solving a problem. The provocative responses can be stepping-stones to developing new ideas.

### **WHY IS THERE THIS ENTIRE BUSTLE ABOUT CREATIVITY?**

A. School does not necessarily help creativity. In fact, modern education, which stresses logic, seems to squelch creativity. Tests show that a child’s creativity plummets 90% between ages five and seven. By the age of 40, most adults are about 2% as creative as they were at five. Some college education — two years, say — may foster creativity, but some experts believe that graduate school may be detrimental in some fields because it perpetuates entrenched thinking. Many innovators, in fact, dropped out of school altogether.

B. Studies show that an exceptionally high IQ is not required: the threshold for creativity is about 130. After that, IQ does not make much difference — such nonintellectual traits as values and personality become more important.

C. There may be such a thing as creative inspiration, but it is not much help without years of grunt work in most fields. Nearly all people renowned for creativity spent years mastering their field. A 1980 study found that it took most great musicians and painters 10 years of hard work before they produced a masterpiece.

D, E, F. The way some experts see it, hang-ups interfere with creativity. Some of the worst hang-ups are: Follow the Rules, Be Practical, and Always Find a Right Answer.

G. Creativity seems to be a combination of **different types of thinking** — analytical, verbal, intuitive and emotional — each controlled by a separate region of the brain. Few individuals have equal capacity for each type of thinking. One solution is so-called **idea teams**. These bring together groups of about seven people from different disciplines. Other companies are setting up what they call innovation centres: artists, craftspeople, technicians, and scientists under one roof.

H. Scientific research is steadily chipping away at the mystery of the creative process — a process many people believe is either a divine gift or a black art. People like to ooh and ah about creativity yet it seems that the creative

process can be explained. By the 1970s many researchers were convinced that the **key to creativity** — the ability to discover new relationships and to look at subjects from new perspectives — was a property of the right side of the brain while the capacity for logical thought resided in the left.

Now they say the left brain/right brain dichotomy is simplified and creativity is a feat of mental gymnastics engaging the conscious and subconscious part of the brain. Although some people have more innate potential to be creative than others, research in the past decade has shown that even in the less gifted it is a skill than **can be fostered**.

### FIRST LADIES

|                              |                                   |
|------------------------------|-----------------------------------|
| Benz Berta                   | Madonna                           |
| Chukovskaya Lydia Korneevna  | Masters Sybilla                   |
| Clinton Hillary              | Minogue Kylie                     |
| Collins Eileen               | Monroe Marilyn                    |
| Dashkova Ekaterina Romanovna | Onassis Jacqueline Kennedy        |
| Dench Judi                   | Ono Yoko                          |
| Federova Oxana               | Princess Diana                    |
| Fursteva Ekaterina           | Princess Victoria                 |
| Gandhi Indira                | Queen Victoria                    |
| Garbo Greta                  | Rice Condoleezza                  |
| Goldberg Whoopi              | Sappho                            |
| Gorbachev Raisa              | Savitskaya Svetlana               |
| Houston Whitney              | Stowe Harriet Elizabeth Beecher   |
| Klumpke Dorothea             | Streisand Barbra                  |
| Kollontai Alexandra          | Tereshkova Valentina Vladimirovna |
| Kovalevsky Sonya             | Ulanova Galina                    |
| Lamarr Hedy                  | Whyte Iris                        |
| Latynina Larissa             | Winfrey Oprah                     |
| Leigh Vivien                 | Zetkin Clara                      |

## СПИСОК ИСПОЛЬЗОВАННЫХ ИСТОЧНИКОВ:

1. Encyclopedia Britannica 2002.
2. Ardo Z. English for Practical Management. M., 1992.
3. Wikipedia, the free encyclopedia.
4. MacKenzie I. Management and Marketing. London, 2001.
5. <http://www.media-post.net/strangeinventions.php>.
6. Cotton D., Falvey D., Kent S. Market Leader. Intermediate course book. 2000.
7. Pyke M. Our future. Hamlyn Paperbacks, 1981.
8. Zaidi S. F. H. Development of Chemistry. <http://www.MuslimHeritage.com>
9. <http://www.1001inventions.com/index.cfm?fuseaction=main.viewSection&intSectionID=240>
10. Аль-Кинди. Арабская философия в переводах А.В. Сагадеева. <http://enoth.narod.ru/Philosophy/Philosophy.htm>.
11. <http://web.ukonline.co.uk/m.gratton/index.html>
12. Bedi J. E. Exploring the History of Women Inventors. <http://invention.smithsonian.org/centerpieces/ilives/womeninventors.html>
13. Bellis M. Mary Kies — Patenting Pioneer. <http://inventors.about.com/library/inventors/blkeis.htm>
14. Bellis M. Martha Coston — Maritime Signal Flares. <http://inventors.about.com/library/inventors/blcoston.htm>
15. Bellis M. Margaret Knight — Queen of Paper Bags. <http://inventors.about.com/library/inventors/blknight.htm>
16. Bellis M. Hedy Lamarr — Movie Star and Inventor. <http://inventors.about.com/library/inventors/blanmar.htm>
17. Sartom H. B. Protecting Precious Cargo: Ann Moore. <http://invention.smithsonian.org/centerpieces/ilives/index.html>
18. Bellis M. Ann More — Snugli. [http://inventors.about.com/library/inventors/bl\\_Ann\\_Moore.htm](http://inventors.about.com/library/inventors/bl_Ann_Moore.htm)
19. Patent Points to Ponder — Mothers of Invention. <http://www.cbgsc.org/Resources/ProgramIdeas/August%20Diversity%201%20of%205.pdf>
20. The First Who. <http://web.ukonline.co.uk/m.gratton/index.html>
21. <http://www.CNN.com>.
22. <http://research.microsoft.com>.
23. <http://www.bkfk.com/index.asp>
24. <http://www.seandwyer.net/index.php/category/strange-inventions/>  
<http://www.brucevanpatter.com/strangeinventions.html>  
<http://www.media-post.net/strangeinventions.php>
25. [http://www.brucevanpatter.com/odd\\_museums.html](http://www.brucevanpatter.com/odd_museums.html)
26. English dictionary. <http://www.allwords.com>
27. McCarthy M., O'Dell F. English Vocabulary in Use. Upper-intermediate and advanced. CUP, 1999.
28. Smith T. Business Law. London, 2000.
29. Sharman E. Across cultures. Longman, 2006.

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