ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО ОБРАЗОВАНИЮ
ГОСУДАРСТВЕННОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ
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Life and Time

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Учебное пособие по практическому курсу «Иностранный язык (английский)» подготовлено в соответствии с государственным стандартом высшего образования и типовой программой по иностранным языкам для неязыковых специальностей высших учебных заведений. Оно может быть использовано студентами дневной, вечерней и заочной форм обучения, а также слушателями, обучающимися по дополнительной образовательной программе «Переводчик в сфере профессиональной коммуникации», аспирантами и соискателями.

Цель пособия – развить коммуникативную компетенцию студентов: их умения получать, перерабатывать и передавать информацию.

Материал учебного пособия включает актуальные проблемы биологии, психологии, социологии.

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МЕТОДИЧЕСКИЕ РЕКОМЕНДАЦИИ ПО ИЗУЧЕНИЮ МАТЕРИАЛА

Высказывание на профессиональные темы зиждется на полученной информации разнообразных источников. Вам предстоит систематизировать материал, чтобы определить понятия «жизни», раскрыть научные предположения о её возникновении и развитии, порассуждать об особенностях современной жизни и времени.

К каждому тексту даётся задание Read the text and be ready for a comprehension checkup. Раздел "Check up for comprehension" содержит вопросы, на которые нужно ответить, читая тексты во второй раз. Раздел "Oral communication" тематически направляет Ваших партнеров по коммуникации, Ваши возможные высказывания.

Тексты-диалоги, тексты-очерки, тексты-статьи условно можно поделить на части для удобства изучения. В связи с этим следует обратить внимание на соответствующие интервалы помеченные тремя звёздочками.

Работая с источниками информации, подготовьте перечень ключевых слов для будущих высказываний, организуйте эти слова в модель-схему, которая поможет Вам строить свою речь логически верно и убедительно. Не пропустите краткие определения понятий, введённые в текст пособия.

Во время общения следуйте таким правилам:

1. *Do not be dogmatic.* Remember that the partner may have a different opinion. (It implies the use of *I think, I believe, I expect* as introducers or as tags; the use of *you know, of course* to imply that the partner is not ignorant; the use of tag questions to invite the partner's agreement).

2. *Avoid offence by correcting. Correcting* is liable to give offence, since it involves telling the partner that he/she has made a mistake. Offence can be avoided by a) apologising for correcting, b) querying what has been, so that the partner can correct the slip, c) presenting the correction as a different opinion.

3. *Be reluctant to say what may distress or displease the partner,* expressing the reluctance (e.g. I don't like saying so, but the music is too loud; I don't want to be difficult, but this machine doesn't work etc.), seeking the partner's agreement (e.g. don't you agree that...), apologising or expressing regret (e.g. I'm sorry, but...), using euphemisms (I can't say I like it instead of I dislike it), implying something unpleasant rather than stating it openly, apologising or expressing regrets for not agreeing while expressing disagreement (e.g. I'm afraid that isn't true).

4. *Do not force the partner to act* (allow him/her to appear to act voluntarily).

TEXT 1. Read the text and be ready for a comprehension checkup

OUR MULTICULTURAL WORLD

Our life is becoming each day more cosmopolitan absorbing elements of ancient) and modern cultures of various nations. Since our childhood, we are impressed by the Labors of Hercules (also Heracles) who killed the nine-headed monster, Hydra, and cleaned the Augean stables (in a day by diverting a river to flow through them). We grieve of the Temple of Artemis at Ephesus, one of .the Seven Wonders of the World, burnt down by the ambitious Herostrates.

If our friend has some weakness, we say that it's his or her Achilles' heel. And when someone is too fond of apocalyptic prophesies we call this person Cassandra. You can see in New York a stage production of *Les Misérables* by Victor Hugo, hear in Brussels *The Barber of Seville* by Rossini or see Stravinsky's *Petrushka* in Vienna.

The Japanese, even though remaining at heart Shintoists, prefer to go through a Christian style of wedding because then they needn't wear a kimono, which is not fashionable now.

At the restaurant, you are served Wiener schnitzel, Czech *knedliki*, Italian spaghetti, Hungarian goulash and paprika, French cheeses — Brie, Camembert, and Roquefort. We dance foxtrot, lambada, mazurka, polka, tango, samba.

Americans count among their national holidays not only Anglo-Saxon festivities but also St. Patrick's Day (17 March), honored by the Irish, Russian Orthodox *Great Fast*, Jewish Passover as well as Russian Orthodox Easter, and Rosh Hashana (Jewish New Year).

Check up for comprehention

1. Why is our life becoming each day more cosmopolitan?
2. What do you think are the Seven Wonders of the World?
3. What elements of ancient and modern cultures of various nations are mentioned in the text?

Oral communication

Let your friend express his/her impression of our multicultural world.

***TEXT 2.* Read the text and be ready for a comprehension checkup**

WHAT IS LIFE?

— What is life? Attempts to define it bog down in hairsplitting exceptions, or go off in weird, uncontrollable directions.

— Aristotle called life, "the power of self-nourishment and independent growth and decay." He said the transition from inanimate to animate is so gradual that boundaries are indistinct. That definition, though not perfect, is probably as good as any other.

— Life isn't fragile. It thrives on adversity. Organisms live comfortably in boiling springs. Bacteria thrive in hot water inside nuclear reactors. Algae grow in salt pools at 59 degrees below zero. Trees buried and charred by volcanic lava put out shoots and bloom again. There is even life at the bottom of deep ocean trenches, thriving and reproducing under tons of pressure.

— That's true. I've read somewhere about one kind of organism, called halophile, that must have salt to survive. It lives comfortably in a 30 per cent salt concentration. But remove a halophile from its natural environment, put it in fresh, clear, warm water, and it explodes and dies.

— Fancy that! It sounds like science fiction to me. In my school days we spoke only of organic and inorganic compounds. Anyway, what elements are you looking for in searching for living matter?

— Organic compounds contain carbon. Molecules of biological interest also contain hydrogen and oxygen, usually as proteins, carbohydrates and fats. A typical analysis of living matter (protoplasm) is 65% per cent oxygen, 18 per cent carbon, 11 per cent hydrogen, and 2 per cent nitrogen. Trace elements are the other 4 per cent.

* * *

— How did life begin?

— Scientists have a thousand theories about how life began. The one currently popular is called the Theory of Chemical Evolution.

— Does it mean that organic matter developed from inorganic matter?

— Could you tell us briefly about that theory?

— With pleasure. It goes like this:

The universe probably began about 15 billion years ago. Long before planets formed, nuclear reactions inside a billion stars created most of the known elements. The solar system condensed about 4.6 billion years ago from the dust and gas of long-dead stars.

— Did Earth have an atmosphere of a kind at that Time? And if so, what was it like?

— Scientists think Earth's original atmosphere was methane, ammonia, water and hydrogen. They believe the molecules important to biology – carbon, nitrogen and oxygen – existed in a hydrogenated form; that is they combined with free hydrogen to form methane (CH_4), water (H_2O) and ammonia (NH_3). Little or no free oxygen existed in the primordial atmosphere.

— How could life, that is organic matter, spring from these elements? What should the conditions be for living organisms to evolve from these elements?

— It has been proved to be possible by Dr. Stanley C. Miller and Prof. Harold C. Urey. They performed experiments at the University of Chicago that seemed to prove life could occur spontaneously under the right conditions.

— That's most interesting! What experiments did they perform?

— Miller and Urey combined methane, ammonia, water and hydrogen in a flask, then exposed the brew to electric discharges.

— And what did they get?

— What was the result of the experiment?

— They found amino-acids – the basic building blocks of life – in their chemical soup.

— Fascinating!

— Unbelievable!

— Fantastic!

— I don't grasp the idea. What are you driving at?

— What's the implication of this fact?

— It implies the following. Organic molecules on Earth apparently evolved when energy (either lightning, solar ultraviolet or heat) soaked the primordial atmosphere. These primitive chemicals accumulated in the oceans, where ever-more-complex molecules formed. Finally one or more of them was capable of reproduction and metabolism (Aristotle's self-nourishment and growth).

* * *

— When did life on Earth begin?

— Life began early in the 4,6 billion-year history of Earth.

— How can you date it? What makes you so sure about it?

— The oldest known fossils are 3.7 billion years old, already complex and well-developed.

— What do scientists think of the early life process? Was it similar to that of our time?

— Early life subsisted by photosynthesis, the process by which organisms absorb carbon from the atmosphere and give off oxygen as a waste product – as plants do today. Through millions of years, the atmosphere gradually changed to its present oxygen-rich composition.

— Does that mean that Earth's early organic substances could not survive today?

— Absolutely correct. Charles Darwin recognized, in 1871, that organic evolution can occur only where living organisms and atmospheric oxygen are absent, I'll quote, if you like, his very words.

— That is most interesting.

— Please, do.

-- "It is often said", Darwin wrote, "that all the conditions for the production of a living organism are now present which could ever have been present. But if we conceive, in some warm pond with all sorts of ammonia and phosphoric salts, light, heat and electricity present, that a protein compound was chemically formed ready to undergo still more complex changes, at the present day such matter would be instantly devoured or absorbed, which would not have been the case before living creatures were formed.

— In other words, organic material that might form today is destroyed rapidly. It is either eaten or oxydized. Have I understood you correctly?

— You have.

— I've got it! On the surface of a planet in an earlier (or different) evolutionary stage than our own, we might find direct evidence of the origin of life.

— Quite. It is very possible.

— We know only a little about life, its causes, origin and evolution. The Theory of Chemical Evolution is just that – a theory. It works, in one case we have studied: life as it occurs on Earth.

— But what of other planets in the solar system or orbiting some other star? Mars is the nearest such planet.

— Scientists ask a blizzard of questions about life. So do lay people.

Check up for comprehension

1. What are geological, biological, biochemical, chemical, physical and humanitarian concept of life? 2. Docs it exist only on Earth? 3. What is the range of physical conditions – temperature, amount of water, atmospheric composition – that can support life? 4. Can life arise and evolve in many directions or only a few? 5. Did life begin in just one place to spread across the universe? 6. Does life be created only from carbon atoms? 8. Or can some other elements do the job?

Oral communication

Satisfy your friend's curiosity.

1. What's your idea of life? 2. What do you think of the evolution of the Earth and life on it?

TEXT 3. Read the text and be ready for a comprehension checkup

WHY DO WE SEARCH FOR LIFE IN SPACE?

— Why do biologists search for lift in space?

— For "sympathetic reasons", as Dr. Norman Horowits puts it.

— Nothing of the kind. Biologists search, even when, the odds against success are staggering, so they can better understand life here on Earth.

— Just the fact that life may be there is tremendously important.

— From the biologists' point of view, the important question is: "Is life on Mars different from life on Earth or is it he same?"

— And if life exists on Mars, and if it is like life on Earth, what could it mean?

— That fact could mean one of several things:

— What are they?

— First, life might begin and evolve wherever conditions are favourable.

— Many scientists believe that if a thing can happen, it must happen, including the beginning and evolution of life.

— Second, life may have begun in one place and spread across the universe.

— I've heard about it. This idea, called "panspermia", often crops up in discussions. Could you say a few words about it?

— Although panspermia could be a natural phenomenon, discussions usually work around to the possibilities of "directed panspermia", where a super civilization has sown the seeds of life across space like some intergalactic Victory Garden.

— Most scientists don't give directed panspermia much credence, although they don't rule out natural occurrence.

— And is there a third?

— There is, and a very important one. Earth Life may have contaminated Mars.

— The odds aren't high but it could happen.

— But how is it possible?

— The objects that have been landed on Mars may not be sterile.

— It is possible, but the chance is less than a million to one.

— What happens if a lander detects organisms similar to Earth forms?

— In that case scientists must decide if it is indeed Martian or if it got there aboard spacecraft, from Earth.

— But Mars' ultraviolet radiation makes survival of Earth organisms on the surface nearly impossible.

— Correct. But it doesn't stop them from surviving inside a lander.

— What are other implications of Martian life for science?

— Because Mars is farther from the Sun than Earth, and has such inhospitable conditions, discovery of life there would broaden the known range of conditions under which Life can begin.

— In other words, if life once started there, the chances that it survived and evolved are much greater than the chances that it died.

— And if it did start and then falter?

— Then the instruments might detect that beginning effort.

— What if the chemistry of Martian biology is different from the chemistry of Earth life?

— Then we must admit we know precious little about life. Differences in this case don't mean small, minor differences but basic differences in the genetic code or a mixed bag of characteristics unknown on Earth.

— On the other hand, if Martian life resembles Earth life, there are far fewer branches on the road of evolution than believed.

— What do you think of the possibility of silicon-based life?

— It's basically "a comic-book idea", as Dr. Horowitz puts it.

— Yet Dr. P.M. Molton discusses silicon-based, halogen-based and ammonia-based life. (In "Terrestrial Biochemistry in Perspective: Some Other Possibilities.") His viewpoint is admittedly optimistic, but he violates none of the laws of chemistry.

— I agree with Dr. Horowitz' point of view. In "The Biological Significance of the Search for Extra-terrestrial Life" he writes:

"The suitability of silicon as a basis of life has been discussed extensively by chemists in the past. The conclusion has been reached that silicon is not suited for the construction of the large, complex kinds of molecules that we associate with the living state. Most silicon compounds are inherently unstable, unlike compounds of carbon, which, owing to the peculiar properties of carbon, are relatively inert even when they are thermodynamically unstable.

It appears that carbon is uniquely qualified among the chemical elements for the building of complex yet stable chemical structures."

— The fact that we have knowledge of carbon-based life and do not know of any other kind is important in our first search for extra-terrestrial organisms. We look for what we can recognize.

— These are some of the scientific implications in discovering life on Mars.

* * *

— But what would it mean to find no life on the red planet?

— Then we have to narrow the range of conditions in which life can exist. We would hypothesize that conditions must be close to those on Earth for life to originate and develop.

— What happens to man's concept of himself if there is life beyond Earth?

— Ancient man thought of himself as the center of the universe. Since everything revolved about Earth, and since man is the highest form of life at the center of things, men built a comfortable, egocentric universe.

Five hundred years ago the Polish priest Nicolaus Copernicus dealt the first smashing blow to that egocentric concept. His belief that Earth was not the center of things – on the contrary, we live on a rather small planet, one of many that orbit the Sun – devastated our concept of ourselves as second highest on the heap.

Later scientists realized that even the Sun isn't the center of things. It's only a rather ordinary star along the edge of a vast group of stars, and there are more than 100 billion of these groups scattered across space.

Man became even smaller.

Then we sent men to the moon. They returned with pictures of our small planet – a tiny, blue and white ball whirling in infinite blackness – and man's mind would never be safe again. From a few thousand miles away, the astronauts and their cameras saw no evidence of political border – or of life, intelligent or otherwise.

Man and his monumental problems and crises became less significant in the cosmic scheme.

But we found no life on the moon; as far as we could tell, life existed only on Earth. As we sent unmanned spacecraft to one after another of the planets, we again saw no signs of life. But now we temper with our very concept of ourselves and our place in the universe.

What if there are living creatures on Mars? No longer is Earth unique; no longer are we the only example. We are not alone.

Check up for comprehension

1. How can Life spread in space? 2. How can Man search for life in space? 3. When did Man start searching for life in space? 4. What are the main stages in the history of the problem?

Oral communication

Tell your friend what Man would do should life in space be discovered.

"Life is the form of existence of the protein bodies". F. Engels

***TEXT 4.* Read the text and be ready for a comprehension checkup**

LIFE AND TIME

Isaac Asimov / Garden City, New York /.

I always make some attempt in these essay collections of mine to impose some sort of order on them. This is not easy to do since the essays were written at different times for different purposes and with absolutely no interconnecting order in mind.

I could impose a mechanical order, therefore, placing the essays in chronological order of publication – or in alphabetical order – or in order of decreasing (or increasing) length – or even in whatever order they come to hand.

I prefer, however, to make the order something more rational if I can; something that will lend meaning and make the book more than the sum of its parts.

In this case, I will try to arrange the essays so that they deal with the far past of life at the beginning and the far future of life at the ending, progressing regularly (or as I can manage, considering the miscellaneous nature of the essays) from past to future in the process.

But I don't intend to be slavish about it. I will begin, for instance, with an overview of life which I wrote for Collier's Encyclopedia once.

LIFE

One of the first ways in which we learn to classify objects is into two groups: 1. living and 2. non-living.

In casual encounter with the material universe, we rarely feel any difficulty here, since we usually deal with things that are clearly alive, such as a dog or a rattlesnake; or with things that are clearly non-alive, such as a brick or a typewriter.

Nevertheless, the task of defining "life" is both difficult and subtle; something that at once becomes evident if we stop to think.

Consider a caterpillar crawling over a rock. The caterpillar is alive, but the rock is not; as you guess at once, since the caterpillar is moving and the rock is not. Yet what if the caterpillar were crawling over the trunk of a tree? The trunk isn't moving, yet it is as alive as the caterpillar. Or what if a drop of water were trickling down the trunk of the tree? The water in motion would not be alive, but the motionless tree trunk would be.

It would be expecting much of anyone to guess that an oyster were alive if he came across one (for the first time) with a closed shell. Could a glance at a clump of trees in midwinter, when all are standing leafless, easily distinguish those which are alive and will bear leaves in the spring from those which are dead and will not? Is it easy to tell a live seed from a dead seed, or either from a grain of sand?

For that matter, is it always easy to tell whether a man is merely unconscious or quite dead? Modern medical advance are making it a matter of importance to moment of actual death, and that is not always easy.

Nevertheless, what we call "life" is sufficiently important to warrant an a definition. We can begin by listing some of the things that living things can do, and non-living things cannot do, and see if we end up with a satisfactory distinction for this particular twofold division of the universe.

1. A living thing shows the capacity for independent motion against a force. A drop of water trickles downward, but only because gravity is pulling at it; it isn't moving "of its own accord". A caterpillar, however, can crawl upward against the pull of gravity.

Living things that seem to be motionless overall, nevertheless move in part. An oyster may lie attached to its rock all its adult life, but it can open and close its shell. Furthermore, it sucks water into its organs and strains out food, so that there are parts of itself that move constantly. Plants, too, can move, turning their leaves to the sun, for instance; and there are continuous movements in the substance making it up.

2. A living thing can sense and it can respond adaptively. That is, it can become aware, somehow, of some alteration in its environment, and will then produce an alteration in itself that will allow it to continue to live as comfortably as possible. To give a simple example; you may see a rock coming toward you and will quickly duck to avoid a collision of the rock with your head.

Analogously, plants can sense the presence of light and water and can respond by extending roots toward the water and stems toward the light. Even very primitive life forms, too small to see with the unaided eye, can sense the presence of food or of danger; and can respond in such a way as to increase their chances of meeting the first and of avoiding the second. (The response may not be a successul one; you may not duck quickly enough to avoid the rock – but it is the attempt that counts.)

3. A living thing metabolizes. By this we mean that it can eventually convert material its environment into its own substance. The material may not be fit for use to begin with, so it must be broken apart, moistened, or otherwise treated. It may have to be subjected to chemical change so that large and complex chemical units (molecules) are converted into smaller, simpler ones. The simple molecules are then absorbed onto the living structure; some are broken down in a process that liberates energy; the rest are built up into the complex components of the structure. Anything which is left over, or not usable, is then eliminated. The different phases of this process are sometimes given separate names: ingestion, digestion, absorption, assimilation, and excretion.

4. A living thing grows. As a result of the metabolic process, it can convert more and more of its environment into itself, becoming larger as a result.

5. A living thing reproduces. It can, by a variety of method, produce new living things like itself.

Any object which possesses all these abilities would seem to be clearly alive; and any object which possesses none of them is clearly non-alive. Yet the situation is not at all clear-cut.

An adult human being no longer grows and many individuals never have children, but we still consider them alive even though they no longer grow and do not reproduce. Well, growth takes place at some time in life and the capacity for reproduction is potentially there.

A moth senses a flame and responds, but not adaptively; it flies into the flame and dies. Ah, but the response is ordinarily adaptive, for it is toward the light. The open flame is an exceptional condition.

A seed does not move, or seem to sense and respond – yet give it the proper conditions and it will suddenly begin to grow. The germ of life is there, even though dormant.

On the other hand, crystals in solution grow, and new crystals form. A thermostat in a house senses temperature and responds adaptively by preventing that temperature from rising too high or falling too low.

Then there is fire, which may be considered as eating its fuel, breaking it down to simpler substances, converting it into its own flaming structure, and eliminating the ash which it can't use. The flame moves constantly and, as we know, it can easily grow and reproduce itself, sometimes with catastrophic results.

Yet none of these things are alive.

We must therefore look at the properties of life more deeply,

And the key lies in something stated earlier: that a drop of water can only trickle downward in response to gravity, while a caterpillar can move upward against gravity.

There are two types of changes: one which involves an increase in a property called entropy by physicist, and one which involves a decrease in that property. Changes that increase entropy take place spontaneously; that is, they will "just happen by themselves". Examples are the downhill movement of a rock, the explosion of a mixture of hydrogen to form water, the uncoiling of a spring, the rusting of iron.

Changes that decrease entropy do not take place spontaneously. They will occur only through the influx of energy from some source. Thus, a rock can be pushed uphill; water can be separated into hydrogen and oxygen again by an electric current; a spring can be tightened by muscular action, and iron rust can be smelted back to iron, given sufficient heat. (The entropy decrease is more than balanced by the entropy increase in the energy source, but that is be side the point here).

In general, we are usually safe in supposing that any change which is produced against a resisting force, or any change that alters something relatively simple to something relatively complex, or that alters something relatively disorderly to something relatively orderly, decreases entropy, and that none of these changes will take place spontaneously.

Yet the actions most characteristic of living things tend to involve a decrease in entropy. Living motion is very often against the pull of gravity and of other resisting forces, Metabolism, on the whole, tends to build complex molecules out of simple ones.

This is all done at the expense of energy drawn from the food or, ultimately, from sunlight, and the total entropy change in the system including food or the sun is an increase. Nevertheless, the local change, involving the living creature directly, is an entropy decrease.

Crystal growth, on the other hand, is a purely spontaneous effect, involving entropy increase. It is no more a sign of life than is the motion of water trickling down a tree trunk. Similarly, all the chemical and physical change in a fire involve entropy increase.

We become safer, then, if we define life as the property displayed by those objects which can – either actually or potentially, either in whole or in part – move, sense, and respond, metabolize, grow, and reproduce in such a way as to decrease its entropy store.

* * *

Since one sign of decreasing entropy is increasing organization (that is, an increasing number of component parts interrelated in increasingly complex fashion), it is not surprising that living objects generally are more highly organized than their non-living surroundings. The substance making up even the most primitive life form is far more variegated and complexly interrelated than the substance making up even the most complicated mineral.

It may be that a simpler way of defining life would involve the finding of some sort of structure or component that is common to all living things and is absent in all non-living. At first glance, this might seem to be extremely difficult to do. Living things vary so widely in appearance that it is easy to suppose that though they may have certain abilities in common they do not have any structures in common.

Thus, though all living things can move, some do it by means of legs, others by fins, flippers, wings, ventral scales, cilia, flat immovable surfaces, and so on. The ability to move is held in common; but there is no one method of motion that seems to be held in common.

Indeed, the variety of life is such that much of the effort of the early biologist was expended in the classification of life forms: the attempt to place them all in an orderly system of groupings so that they might be studied with greater ease and to better advantage.

All visible forms of life, for instance, would seem to fall into one of two extremely broad groups: plants and animals.

Plants are rooted to the ground or float passively in the sea, while animals, on the other hand, frequently have the capacity for voluntary rapid motion. Plants have the capacity to use the energy of sunlight directly to power metabolism, making use of the green compound chlorophyll for the purpose. Animals lack chlorophyll and obtain their energy from the complex compounds of the food they eat. (Naturally, they eat plants, getting their energy from sunlight at one remove; or they eat other animals who have eaten plants and get their energy from sunlight at two or more removes.). This division into plants and animals can even be extended info the microscopic world, for there are tiny organisms, invisible to the unaided eyes, which share key properties with the larger plants, or with the larger animals.

(Some argue, however, that the microscopic living things differ sufficiently from larger organisms, to warrant a separate, third division for themselves. Those who argue so call the microscopic organisms protests.)

The plant and animal kingdoms are each divided into finer divisions called phyla. The phyla are in turn divided into finer and finer divisions: first classes, then orders, families, genera, and finally, species.

It is the species which represents a single kind of living thing. Man is a single species; the lion is another; the common daisy, another.

The number of different species, however, is enormous. There are about 400,000 different species of plants and about 900,000 different species of animals. (New species are constantly being discovered.)

What, then, can possibly be held in common by 1,300,000 species that differ as widely among themselves as do men and earthworms, whales and oysters, larks and moss, oaks and tadpoles, seaweed and elephants? (And this says nothing of many thousands, or even millions, of extinct species from trilobites to the giant moa.)

To the eye, there is no answer. Though use of the microscope, however, the answer was given long ago. In 1838, a German botanist, Matthias J. Schleiden, suggested that all plants were made up of separate microscopic units called cells. In 1838, a German zoologist, Theodor Schwann, extended the notion to animals.

Each cell is a self-contained unit, marked off from all the others by a membrane and capable of demonstrating in itself the various abilities associated with life. A cell, or parts of it, can move, sense, and respond, metabolize, grow, and reproduce.

Organisms large enough to see with the naked eye are made up of large numbers of cells. An adult human being contains some fifty trillion (50,000,000,000,000). Each cell in such a multicellular organism is so adapted to the presence of others as no longer to be capable of living independently. Most forms of microscopic creatures are made up of single cells; they are unicellular organisms. And even large creatures begin life as single cells. Each human being got his start as a fertilized ovum – one cell.

Moreover, though organisms may differ enormously, the microscopic cells of which they are composed do not differ nearly as much. A whale cell is much more like a mouse cell than a whale is like a mouse.

All plants and animals are made up of cells, and those parts of a living organism that are not made up of active cells are not alive. (A tree's bark is not alive, nor is an animal's hair, nor a bird's feathers, nor an oyster's shall – which does not mean the organism can necessarily live without that non-living portion.)

Furthermore, no non-living thing is made up of active cells – though a freshly dead organism is made up of dead cells. (Some cells may live on briefly after the overal death of the creature; but before long, all are dead.)

The phrase "active cells" implies that the cells can perform the actions characteristic of life, so we are now defining life as the property of objects made up of cells possessing the ability to move independently, sense and respond adaptively, metabolize, grow, and reproduce.

This eliminates any possibility of imaging such non-cellular objects as crystals and fire as having life.

Yet there still remains a source of confusion. In 1892, a Russian bacteriologist, Dmitri Ivanovsky, discovered a disease agent so small it could easily pass through a filter designed to bar the passage of even the smallest bacterium. Thus were discovered the viruses which are much smaller than cells and which, in isolation, show none of the ordinary criteria of life, Indeed, they can even be crystallized and, at the time this was discovered, crystallization was felt to be a property that could not possibly be associated with anything but non-living chemicals.

Yet once in contact with cells, individual virus particles can somehow penetrate the cell membrane, bring about specific metabolic reactions and reproduce themselves. In some ways and under special conditions, they show unmistakable properties associated with life. Are viruses, then, alive or not?

If life is defined in terms of cells, viruses are not alive, for they are much smaller than cells. But can life be defined still more fundamentally and usefully so as to include viruses as well? To see if that is so, let's consider the substances of which cells are composed.

* * *

Cells contain an enormously complex mixture of substances, but these are built up out of only a few elements. Almost all the atoms they contain are of half a dozen different kinds; carbon oxygen, hydrogen, nitrogen, phosphorus, and sulfur. There are smaller quantities of other atoms such as those of iron, calcium, magnesium, sodium, potassium, and traces of copper, cobalt, zinc, manganese, and molybdenum. There is nothing in these elements themselves, however, that gives any clue to the nature of life. They are common enough in non-living objects.

The atoms within the cell are grouped into molecules that, in the main, fall into three types: carbohydrates, lipids, and proteins. Of these, the proteins molecules are by far the most complex. Whereas molecules of carbohydrates and lipids are usually made up of carbon, hydrogen, and oxygen only, proteins invariably include nitrogen and sulfur as well. Whereas carbohydrate and lipid molecules can be broken down to simple units of two to four kinds, the protein molecule can be broken down into simple units (amino acids) of no less than twenty different varieties.

Proteins are of particular importance in connection with the thousands of different chemical reactions constantly proceeding within cells. The velocity of each different reaction is controlled by a class of protein molecules called enzymes – a different enzyme for each reaction. The cell contains a large number of different enzymes, each present in certain amounts and, often, in certain positions within the cell. The enzyme pattern determines the pattern of chemical reactions and therefore controls the nature of the cell and the traits of the organism built up out of the cells.

The properties of the enzymes molecule depend on the particular amino-acid arrangement it possesses. The number of possible arrangements is inconceivably large. If a molecule is made up of 500 amino acids of 20 different kinds (average for a protein), the total number of possible arrangements can be high as 10^{1100} (a figure we can write as a 1 followed by 1,100 zeroes). How, then, does the cell form the particular arrangement needed for particular enzymes out of all those possibilities?

The answer to this question seems to lie in the chromosomes, small thread-like structures in a small body called the nucleus, usually located near the mid-point of the cell. Whenever the cell is in the process of division, each chromosome forms another just like itself (replication). Each of the two daughter cells formed at the end of the division gets its own duplicate set of chromosomes.

Chromosomes are made up of protein in association with an even more complex molecule called deoxyribonucleic acid, usually abbreviated as DNA. The DNA contains within its own structure the "information" needed for the construction of specific enzymes and also for the replication of itself so that it can continue to guide the construction of specific enzymes in the daughter cells. Every single creature has the DNA molecule to build its own enzymes and no other.

Is it possible that, just as certain organisms may consist of individual cells, still simpler ones may consist of individual chromosomes? Apparently yes, for viruses are very much like individual and independent chromosomes.

Each virus is composed of an outer coat of protein and an inner molecule of DNA (or, in some cases, a similar molecule, ribonucleic acid or RNA). The DNA or RNA manages to get inside a cell and there supervises the production of enzymes designed to produce more virus molecules of exactly the type that invaded the cell.

If, then, we define life as that property possessed by objects containing at least one active DNA, or RNA, molecule, we may have all we need. The cells of all plants and animals, and of all unicellular organisms, and the molecules of all viruses as well, all contain at least one DNA r RNA molecule (and, in the case of the cells, many thousands). As long as these molecules are capable of guiding the formation of enzymes, the organism is alive with all the attributes of life. Objects that were never alive, or were once alive but are no longer so, do not possess active molecules of DNA or RNA.

* * *

Living creatures represent different levels of complexity and organization. A large creature is generally more complex than a small one of the same kind, if only because it has more interrelated parts. Animals in general are more complex than plants. For one thing, animals have particularly complex tissues such as muscle and nerve, which plants lack. A mouse may fairly be considered to be more complex than an oak tree for that reason.

The most complex structures found in the animal organism generally are the brains; and these are most complex in certain mammals. The largest brains of all are those of men, elephants, and whales. The human brain, for instance, weighs three pounds and is composed of ten billion nerve cells and ninety billion auxiliary cells, with each of the nerve cells connected to perhaps a thousand others, and each individual nerve cell enormously complex in itself. Pending further information the complexity of the brains of elephants and whales, it seems fair to say that the human brain is the most highly organized object known to us.

Naturally, this level of organization was not achieved in a bound, but was the product of at least three billion years of slow changes. The changes themselves were produced by random imperfections in DNA replications, which led to corresponding changes in enzyme structure and therefore to the reaction pattern in cells. Those particular changes survived which, for one reason or another, proved beneficial to the organism under the particular conditions existing about it. (Such a theory of evolution by natural selection was first advanced by the English biologist, Charles Darvin, in 1859.)

But how did the whole process get started? Right now, every cell is formed from a previously existing cell. Every DNA molecule is produced by a previously existing DNA molecule. Yet surely life did not always exist, since there was a time when Earth itself did not exist. How, then, did the first cell, the first DNA molecules, come into existence?

Many suppose that some supernatural being created life. Scientists, however, prefer not to seek explanations in the supernatural. They suppose, rather, that the known laws of physics and chemistry suffice to offer possible mechanisms for the origins of life.

Could life have come from some other world? The most popular version of that theory was advanced in 1908, when a Swedish chemist Svante Arrhenius suggested that living spores might be driven across the great gaps of space between the stars by the pressure of starlight. Some would have fallen on the youthful Earth and would have begun life there. But that only postpones the difficulty. How did life originate on the planed from which the spores came?

In recent years, scientists have begun to consider the chemical makeup of the Universe generally. The Universe is believed to be about 90 per cent hydrogen. When the Earth was formed, its atmosphere must therefore have been rich in hydrogen-containing compounds. If we consider hydrogen combining with other common elements, we can imagine Earth's atmosphere to have consisted originally of methane (hydrogen combined with carbon), ammonia (hydrogen combined with nitrogen), and water (hydrogen combined with oxygen).

What would happen if such compounds and others like them were exposed to a bath of energy from the sun. As they absorbed the energy, would they build up more complicated compounds?

In 1952, an American chemist, Stanley Lloyd Miller, prepared a mixture of chemicals such as were believed to exist on the early Earth. He subjected them to the energy of an electric discharge for a week, then he analyzed his mixture. He found that more complicated compounds had indeed been formed. In particular, two or three of the simpler amino acids that go into the makeup of proteins were formed.

Ever since then, similar experiments have performed by many groups, and it has turned out that the basic compounds associated with life can in this way be formed from the very simple compounds that were probably found on the early Earth.

The American chemist, Sidney W. Fox, began with amino acids and subjected them to heat. He found that proteinlike molecules were formed which, on the addition of water, clung together in little micpospheres about the size of small bacteria. Can cells have made their primitive beginning in this way?

It may have taken a billion years or so for compounds to become complex enough, and cells to grow copmlicated enough, to form objects we might recognize as very simple forms of life. Once that happened, the living cells would compete with each other for food, and those that were more efficient would survive at the expense of the others. With time, cells would grow more and more organized and complex.

Originally, the cells would have to use as food the complex compounds built up by the slow action of the Sun's ultraviolet radiation. In the process, the methane and ammonia in the atmosphere would be changed to dioxide and nitrogen.

Eventually, certain cells developed the use of chlorophyll, which allowed them to use Sun's visible light as a source of energy, in a process called photosynthesis. This enabled them to build up complex molecules far rapidly.

In photosynthesis, carbon dioxide is consumed and oxygen is liberated as a product. Eventually, the carbon dioxide and nitrogen atmosphere would be converted to the oxygen and nitrogen atmosphere we have today.

Is it possible that life started only once and that from the initial life form, all present life developed? That would be why, perhaps, all species have a basic chemical similarity. Or did it begin a number of times, with each life form basically similar to all the others because only one form of chemistry can lead to substance complex enough to demonstrate the properties of life?

It is impossible to check up this by watching for life to form under our nose on Earth as once it did. Billions of years ago, life had a chance to form because there was no life already existing. Nowadays, any complicated molecule forming on the way to life would quickly be eaten by some already existing life form.

* * *

But what of other planets? Ordinarily, we do not think of the other planets of the Solar systems is capable of supporting life. Earth life is adapted to Earthly conditions so that most forms of life require oxygen and water, a moderate temperature, the absence of poisonous compounds, gravity and air pressure not too different from what actually exists, and so on.

The Moon, then , would seem no fit abode for our kind of life because it lacks air and water. Mars' thin atmosphere has no oxygen and it possesses very little water.

Nevertheless, even though men and other highly organized creatures could not live unaided on the Moon or on Mars, it is possible that simple protistlike creatures might have developed. Underneath the Moon's outer surface, there are mild temperatures where small quantities of trapped water and gasses may exist. There, a thin population of bacteria might live. On Mars, there is even the possibility of simple lichenlike plants.

If these extraterrestrial life forms actually existed, and were like our own, chemically, that would be strong evidence in favor of only one possible chemical basis of life. If they were not like our own, how fascinating to study a second (and third?) chemical basis of life we can't even conceive now.

No wonder space scientists are anxious to sterilize all manmade objects that will touch down on an alien world. If we contaminate such a world with our own bacteria, the most exciting experiments in biological history may be robbed of their meaning.

But what about highly developed life? What about intelligence?

There doesn't seem to be any world in our Solar system that could support highly developed life based on Earthly life chemistry. For that, we would have to look to planets circling other stars.

There, the possibilities seem good. There are, in our own Galaxy alone, about 135,000,000,000 stars. According to modern theories of planet formation, almost all ought to have a system of planets. Some of the stars ought to be rather like our Sun, and some of these ought to have at least one planet like the Earth at the proper distance.

In 1964, the American astronomer, Stephen H. Dole, taking into account as much information as possible, estimated that the number of planets like Earth in our own Galaxy alone, would be 645, 000,000. (And there may be as many as a hundred billion other galaxies in existence, too.)

On any planet very much like our Earth, chemical changes would take place similar to those that took place here. Life would form – but even if it formed on the same chemical basis, no one could tell how it would appear structurally. Considering in how many different ways life developed on Earth and how many hundreds of thousand of different species formed, it seems unlikely that a similar wild variety would not form there, and it would be an almost impossible chance to have a species there closely resemble some species here.

Yet some alien life forms might develop intelligence and that intelligence, at least, might resemble ours. Unfortunately, there is no way of estimating the chances of the development of intelligence.

Still, even if intelligence eventually developed only one time in every million life-bearing planets, there might be over six hundred different types of intelligent beings in our own Galaxy alone.

Unfortunately, the Universe is vast. Our own Galaxy is so huge that if even as many as 645,000,000 planets were spread out evenly, the nearest one to us would be some two dozen light-years distant, and the nearest intelligence (even assuming these existed) might be no closer than 25,000 light-years.

Whether such distance can ever be spanned or not is uncertain, Perhaps the various intelligences are forever insulated from each other, or perhaps if some of them are more advanced then we are, then they may come visit us someday (when we are ready for them) and invite us to enter a United Galaxy Organization.

What about life forms radically different from ours, based on altogether different kinds of chemistry, living in completely hostile (to us) environments? Could there conceivably be a silicon-based life, in place of our own carbon-based one, on a hot planet like Mercury? Could there be an ammonia-based life, in place of our own water-based one, on a cold planet like Jupiter?

We can only speculate. There is absolutely no way to tell at present.

We can wonder, though, whether human astronauts, exploring a completely alien planet, would be sure of recognizing life if they found it. What if the structure were so different, the properties so bizarre, that they would fail to realize they were facing something sufficiently complex and organized to be called living?

For that matter, we may be facing such a necessary broadening of the definition right here on Earth in the near future. For some time now men have been building machines that can more and more closely imitate the action of living things. These include not merely objects that can imitate physical manipulations (as when electric eyes see us coming and open a door for us) but also objects that can imitate men's mental activities. We have computers that do more then merely compute; they translate Russian, play chess, and compose music.

Will there come a point when machines will be complex enough and flexible enough to reproduce the properties of life so extensively that will become necessary to wonder if they are alive?

If so, we will have to bow to the facts. We will have to ignore cells and DNA and ask only: What can this thing do? And if it can play the role of life, we will have to call it living.

Check up for comprehension

1. The task of defining life is both difficult and subtle, isn't it?
2. Is it always easy to tell a living thing from a non-living one?
3. What is listed among the properties that living things can have?
4. What is the first life definition given by I. Asimov?
5. What is the way the scientist divides all visible forms of life?
6. What does he consider necessary to add to the first definition of life?
7. What is the last property whish should be added to the definition of life, in his opinion?
8. Could life have come from any other world, in the writer's view?
9. Will life come from any other world in future?
10. What does I. Asimov think of any living possibilities of complex machines?

Oral communication

1. Ask a friend of yours to find each cell characteristics in the text and express his or her opinion on the subject?
2. Prove yours friend the way I. Asimov gives definition of life is really scientific one.

Biology is the science of life, of its forms and laws that govern it.

TEXT 5. **Read the text and be ready for a comprehension checkup**

EVOLUTION AND HEREDITY

More than a hundred years ago people believed that plants and animals have always been as they are now. They thought that all the different sorts of living things, including men, had been put here by some mysterious power.

It was Charles Darwin, who showed that this was just a legend.

As a boy Darwin loved to walk about the countryside collecting insects, flowers and minerals. He enjoyed helping his elder brother at chemical experiments in a shed at the far end of their garden.

These hobbies interested him much more than Greek and Latin, which were his main lessons at school. His father, Dr. Robert Darwin, sent Charles to Edinburgh University to study medicine. But Charles disliked the medical career. He spent a lot of time with a zoologist friend watching bird and other animals in their natural state and collecting insects in the surrounding countryside.

Then his father sent him to Cambridge to become a clergyman. But Darwin did not care for lectures. He did not want to be a clergyman. At 22 he graduated from Cambridge University and soon was offered an unpaid post as naturalist on the ship "The Beagle".

The young naturalist asked himself whether all forms of life always existed just as they are now. This was what everyone believed and what he had been taught, but he doubted it very much. Three and a half years travelling around the world on the British ship "The Beagle", convinced Darwin that man and all the living creatures on earth today are related. All have grown from earlier types, and those from earlier ones in an unbroken line back to a primitive one-cell creature.

More than a thousand million years ago, a small blob of jelly floated on the shallow seas of the young earth. It and others like it were the only life on Earth. In half a milliard years that blob of jelly had become different kids of sea worms and sea scorpions, seaweeds and other simple sea plants.

During the text half milliard years some of this life crawled onto the barren land. From the seaweeds that took root on shore came ferns and mosses. The first land animals were "amphibians", equally at home on land and the water, like present-day frogs. There were also primitive scorpions, the descendants of which became insects or spiders. The amphibians became reptiles. For one hundred million years they ruled the earth. Out of them came birds and mammals. Gradually the mammals changed into all the different kinds we have today, including man. Each of these changes was very gradual and took thousand of years.

* * *

What makes you and your brothers and sisters look somewhat alike? What makes all of you look like your father and mother, and yet also a little different? The answer is to found in the laws of heredity.

Gregor Mendel, son of an Austrian farmer, wanted to be a scientist but couldn't afford the university. So he became a monk and, in the garden of the monastery he raised garden peas – pure tall, pure dwarf and so on. Then, when he was sure that he had pure strains, he began crossing them. He did the same with green and yellow peas. In all he raised and studied more than 10.000 specimens.

From the way these peas transmitted and inherited various traits, such as height or colour, Mendel worked out the laws of heredity. They have been found to be true for all types of plants and animals, including man, and have been widely used in the improvement of flowers and agricultural crops and the breeding dogs and livestock

Check up for comprehension

1. What did Darwin as a boy and a student enjoy doing?
2. What did he study at the famous English universities?
3. What was the way he imagined the evolution of life?
4. Why did Gregor Mendel first become a monk?
5. What did he do as a scientist in the garden of the monastery?
6. What was the way he worked out the laws of heredity?

Oral communication

1. Is the way Charles Darwin imagines the evolution of life true or false in your opinion?

2. Ask a friend of yours to develop the ideas of Gr. Mendel's laws of heredity.

TEXT 6. Read the text and be ready for a comprehension checkup

HOW DID LIFE BEGIN?

The great religions have their own accounts of Creation it has been done by the God and it took him seven days to create the world and life. Scientists face many mysteries, but there is none so compelling as the mystery of how life on Earth began. Scientists have never been able to construct a complete account of the way and moment when dead molecules came together to form organisms that could feed, grow, reproduce and evolve. Nevertheless recent work has suggested some promising theories.

Some new explanations are associated with science fiction. Astronomers Ferd Hoyle and N.C. Wickramasinghe suppose that organic molecules fell to the Earth from comets – and indeed meteorites containing organic substances have been found. Biologists Francis Crick and Leslie Orged think that Earth might have been seeded with life by some intelligent beings from advanced planets.

The more prevalent theories, however, do not depend on extraterrastrial intervention. They fall into two main categories: the view that life began almost as an Earth formed, and the view that life emerged in the result of some reactions in the prehistoric ocean on Earth.

At a symposium chemist Carl Woese of the University of Illinois suggested that life on Earth coincided with the birth of the planet. To his mind, dusty water droplets could have collected the chemicals that rapidly evolved into life. Other chemists think creation took millions of years. Earth began with an atmosphere containing almost no oxygen, but mostly water vaper, methane, carbon dioxide and ammonia. It is simple to make prelife molecules with these gases, suppose Stanley Miller and Harold Urey of the university of Chicago. Chemist Sidney Fox of the University of Miami thinks life began with a protein droplet, perhaps on a volcano.

However the elements of life formed or joined, the more fundamental question goes deeper than chemistry. Biological theories face a chicken-and-egg dilemma: which came first, an isolated bag of proteins or a naked gene? The answer touches the definition of life: is the key feature of life the ability to eat and grow, as proteins do, or to reproduce and evolve, as genes do?

Most scientists, however, believe that the essence of life is evolution, which requires genes. Genes make exact copies of themselves and undergo the mutations and natural selection that produce higher and higher organisms. Among these scientists are Leslie Orgel of the Salk Institute an A.I. Oparin, our Russian biochemist. In his book "The Origin of Life" A.I. Oparin wrote: "The origin of life was a transmition from organic to biological chemistry, from the lifeless to living matter, from the inanimate to animate realm of nature". According to his theory life arose on earth because of the widespread distribution of carbon, an element with an exceptional tendency to combine with other substances.

All these theories imply that if life happened here, it could happen elsewhere in the universe.

Check up for comprehension

1. What kind of mystery scientists face is the most compelling?
2. What is the great religious point of view of the problem?
3. What explanations are associated with science fiction?
4. What about the more prevalent theories, what categories do they fall in?
5. What is the essence of these theories?
6. What is the most fundamental question scientist decide?
7. What do most scientist believe?
8. What did A.I. Oparin write in his book on the problem?
9. Why carbon is considered the most important element in the process of life's origin?
10. All these theories imply that life could originate elsewhere in the universe, don't they?

Oral communication

1. Give a talk on the origin of life on Earth with a friend of yours.
2. What kind of dilemma do biological theories face, in your view?

TEXT 7. Read the text and be ready for a comprehension checkup

HEREDITY – CAN IT BE CONTROLLED?

The answers have been discovered quite recently, thanks to genetics, an important branch of biology.

Each organism develops by means of the division of a single microscopic cell, the zygote which is formed at the moment of fertilisation by the fusion of the male and female germ cells.

The zygote divides into 2 cells then 4, 8, 16 and so on, up to the 20 million million cells comprising the organism of an adult. With the process of division there originate specialised cells which form specific organs. The zygote, that tiny cell, carries a "record" of the incalculable number of characteristics of the future organism, from the colour of the eyes to the finest details of the metabolism. And the "record" is so stable that it remains practically unchanged for many centuries. It could not be otherwise for without inheritance stability – if it were not so difficult to vary heredity – plant and animal species would vary with great frequency.

If heredity is a stable thing, what causes the rare changes which we do observe?

We should seek the answers in the structure of the cell and of its main component – the nucleus – in particular.

It appears that the bearers of all hereditary characters are chromosomes – minute formations present in the nucleus of any cell.

Roughly speaking chromosomes may be compared to sheaves. They hold together very fine end very long molecular chains of desoxyribosenucleic acids (DNA).

It has also been finally established that no elements of the cell other than the DNA are capable of passing on hereditary characters.

We are now on the verge of controlling heredity. The time not far off when it will be changed as man wishes.

Check up for comprehension

1. What's the way each organism develops?
2. Is heredity a stable thing?
3. What causes the rare changes which we do observe?
4. What are the bearers of all hereditary characters?
5. And what are the elements of the cell capable of passing on hereditary characters?

Oral communication

Could you give your friend any examples of people's ability to control heredity?

Psychology as a science studies mental activity and human behaviour. Psychologists study basic functions such as learning, memory, language, thinking, emotions, and motives. They investigate development throughout the life span from birth to death.

TEXT 8. Read the text and be ready for a comprehension checkup

MAN AS THE SUBJECT OF LIFE

Natalia Grishina[1]

Times change, and so does man. The history of human society is the continuous process of development and strengthening of human individuality.

In the evolution of societies, some cultures acquire importance (M. Mead). Traditional primitive cultures are characterized by slow and gradual transformations: noticeable changes take longer than the individuals' lifespan. Life is lived according to the "ancestors' laws": social rules, traditions, systems of values and social standards are the main regulators of individual destinies. Individual choice and the power to shape one's own life are very limited. According to Mead, *the answers to questions such as "Who am I? What is the essence of my life as a representative of my culture? How should I talk, move, eat, sleep, love and earn my life or wait for death?" are preset* (M. Mead 1988, p. 325). The rigid determination of behaviours "from the outside" is connected to the importance given to the stability of the community, deemed essential for its survival.

The progressive acceleration of historical changes determined the impossibility to live according to the *"ancestors' laws"*, examples from the past and comparisons to such examples lost their sense. The *"law of the fathers"* remained however: there was no generation gap, communities and the mechanisms of transmission of the ancestors' culture to younger generations remained the same. Man was still anchored to his roots and his family, i.e. to a determined social status which established the main principles of existence: the kind of work, lifestyle, his daily life, etc. Over a long historical period, human life was run by external traditional authorities. Let us think about society and its rules, the Church and its power, which determined the whole of

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credos, but also the rules of existence, with parental power that established deeds, behaviours, concrete and forbidden decisions.

Naturally, history has always witnessed men capable of resisting this "*pressure of social reality*"; but as soon as they tried to overcome the bounds of this "*private world*", they boldly had to discard their fathers' existential models to create new behavioural models.

Gradually, with the acceleration of historical transformations, came situation in which the experience of the fathers ceased to be a social and cultural model, or at least a point of reference for the younger generations. Among the characteristics of the "new era" we find not only the overcoming of traditional society with its rigid rules (established for the different social strata), and the weakening of the customs and the cultural norm, but also, and primarily, the replacement of social, common, external rulers of life with the inner, individual choice of the human being.

This replacement of external behavioural rules has redefined the relation of man with the world, in which external pre-determination of human life is replaced by the necessity of making decisions and being responsible for them.

In the first part of the book dedicated to the Ontopsychological view on memetics[2], professor A. Meneghetti notes that today "*we live in a new world, and therefore need a new way to relate to the objective reality and to ourselves*".

The basis of human behaviour is made of different systems of regulation. A part of our behavioural activity is determined by vital needs: in order to live, we must eat, drink and sleep; in short, we must have adequate means and convenient conditions. Other vital needs are what determine our acts and decisions in more complex situations: for instance, once we have completed our studies, we must choose how to proceed. In this sense, we are free to choose the means and modalities for solving our problems and attaining our goals, but we are not free from the necessity to act. We are, in other words, under the pressure of "*vital necessity*".

Part of our decisions or actions results from the influence of social factors, starting with the surrounding environment and more generally the social environment. Choosing a profession, for example, can be conditioned not by the personal intention of the young person, but by the parents' desire. Another example would be a man going to the theatre not because he loves the art, but because that is what everybody does, etc. The social system imposes certain actions, which we may not recognize as meaningful; in such instances we yield to the pressure of the social need. This, though, does not mean that social influence always deviates a human being from his or her desires; traditions and social rules gather the experience of human society and they can adapt our behaviour to many social situations. The acquisition of experience and social competence are a part of our system of adaptation to the surrounding world.

The decisions that we make must somehow correspond to the principle of existential economy, that is, we must not spend more energy or time than we have to.

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[2] Ontopsychology and Memetics ibid.

The less the limitations related to what we hypothetically define as *vital or social* need, the more dynamic and changing the external situation, the more we are faced with the task of self-determination: the capacity of decision making and choosing what to do, how to spend time and, in general, how to organize our lives.

We are faced with the task of making a personal choice even when we are dissatisfied with our existential situation, when we refuse to "*go with the flow*" and when we need the courage to change our everyday life, maybe our whole life. Even in this case, though, our choice cannot be considered free or totally precise, because this may be determined by the stereotyped identification of the situation, or by the habit of making 'decisions according to ideas formed by deviating structures.

The modern human being's capacity to counterpoise institutional situations of power and authority is increasing, like social or religious canons and familial power, but we end up as the objects of a more subtle and sophisticated influence. The memetic structures of society take us back to the behavioural logic ordered by an external reality, with the effect that "*the human being loses the coincidence with its primary reality*".[3] Self-determination and autoctisis, that is, freedom of choice, pre-require the capacity to resist external interference, which often impose a certain decision, as well as the influence of our own fixed stereotypes which cause fear of change.

Psychologists say that the limits preventing positive change in our lives are mostly found inside us. The ability to change in an existential situation requires the courage to overcome fixed stereotypes and the conviction to take responsibility for our own decisions and their consequences.

In what way can modern psychology (as the science of the soul) offer practical help to people who want to achieve their potential of life?

Classical psychology (the psychoanalytical and behaviourist tradition) considers man as a determined being. According to psychoanalysis, the human being is determined by his or her intra-psychic particularities, inner problems and complexes, that seem to *enslave* him (according to Vygotsky's expression). For the behaviourists, the human being is the product of an external situation, whose stimuli determine all human behaviour.

The key concept of classical psychology is in a certain sense the concept of adaptation, i.e. the ideal aim of the practical help to the human being is the achievement of the best adaptation to the external world.

Psychoanalysis used a conception of a person's "best possible state" to solve the human being's problems.

Behaviourism, conversely, aimed its efforts in finding the way that would guarantee the "optimal functioning" of the human being, primarily in relation to his existence in social structures (their followers use a more explicit term: "*programming*").

So these currents of thought, rather than addressing the problem of the human being's authentic existence, tried to solve the problem of an efficient adap-

[3] Ibid. p. 25.

tation to the surrounding world, based on external criteria predetermined by the social stereotypes of the time, and according to the possibility foreseen by the theoretical schemes and the elaborations of the psychologists.

Nevertheless, the increase of personal freedom makes many psychological concepts irrelevant: what happens in a person's life cannot be caused solely by his individual psychological particularities, nor by the situation and its stimuli only.

Being capable of self-determination, man can contrast the action of these factors at any moment. Traditional psychology cannot explain the phenomena that go beyond the bounds of what is "pre-established" in the psychological and social characteristics. The modern human being is only determined by these "objective" characteristics to a very small extent. Man opposes the social, psychological and even biological restrictions, destroying the traditional concepts and roles (to the point of changing one's sexual identity).

Humanistic psychology has accomplished a famous "revolution" in shifting the focus of psychology to the problem of the *authenticity of humane existence*, which becomes the criterion of psychic well-being and personal evolution. Even in its existential branch, though, (existential psychology, in the strict meaning of the word, means the psychology of man's existence), humanistic psychology remains far from the "*being*" of man.

Classical existentialists focused on how a human being subjectively experiences his existential problems, without finding and describing the ontic aspects of the human existence. In comparison with Ontopsycholbgy ("*We can be and also know how to be*"), we can say that humanistic psychology has focused its attention on the way man becomes aware and experiences the problems of being, therefore considering his personal emotional experience, rather than his "*capacity of being*".

Contemporary psychology, especially its practical branch, tries to overcome the fragmentary description of man. Even if the principle of *holism* (asserting that personality can be understood only based on its total perception) already existed in psychology, it is not appropriate to consider it achieved, because even today psychologists operate with categories such as the single characteristics and particular proprieties of the personality.

In any case, some "vital" categories are becoming more widespread: the world-of-life, the environment and the vital situation, strategies and lifestyles. These categories not only allow a description of the human being and his experience, they also help the research for criteria that correspond to the need of science and research of the ways of existing in this world. In the description of constructive strategies to overcome the difficulties of life, for example, we often distinguish the psychological characteristic of *internalization*, that is, man's disposition to recognize his capacity of control over his life: the capacity of self-determination.

The results of our research on the scenarios and logics of life allow us to individuate a criterion that permits us to highlight the potential of self-determination of personality: *the way in which man chooses and takes the most important decisions*.

In particular, people with evident potential for leadership in situations of important decision-making (choosing a profession, a job, a family, changing jobs, etc.) usually tend to make an individual choice which often contradicts conventional logic or external influences, basing everything on personal ideas and intuition. When questioned, they affirm that many times their decisions were neither approved nor explicitly refused by the environment.

Therefore we can consider this tendency (that of making important decisions independently or *despite* the logic of social or vital obligation) as a *capacity of self-determination* and resistance to external and internal pressure.

As stated above, the pressure caused by the social reality takes on subtle and sophisticated aspects. Only inside ourselves can we find the resources to resist these aspects.

The possibility of becoming authentic presupposes the capacity to control our existential situation and the possibility to change it, therefore it implies the possibility of resisting social pressure.

This includes:

– Self-determination: the capacity to make decisions independently. This is the basic condition for a subjective position in the relationship with the social environment. The loss of the capacity to make independent decisions transforms the human being into an object of influence.

- Autonomy and independence: the ego does not identify with the social roles representing the contact with society. The identification of one's personality with particular social roles creates a situation of dependence of the bearers of connected roles (for example, the strong identification with the role of employee creates dependence on the boss; the identification with the role of the leader creates dependence on the employees, who must confirm the importance of the ego in the role of the boss, etc.). In this sense, the methods used by existential therapy can be useful, exercises for the deidentification that help the subject to take a step back from his roles and concrete social functions.

– The verification and transformation of the ways of reacting to external circumstances or components of the existential situation. A strong reaction denounces the affective involvement of the subject to the corresponding situation, therefore the subject's dependence from that situation. A constructive and alternative method is the capacity of creating a distance from a concrete context, allowing the subject to regain control over situation and the capacity of independent evaluation. Psychologists have deep knowledge of the evident facts of man's subjective reaction to external circumstances. Therefore, the way to experience critical situations that can be perceived as stressful or that can turn into deep personal crisis is often determined not only and not so much by the particularity of the circumstances, but by the individual particularities of the subject. So, we have resources that allow us to resist even in existential critical situations.

– Learning the "rules of the game" that (according to a principle of existential economy) allow interaction with society and participation to situations that have no personal value. According to H. Thomae, author of a famous longitudinal research carried out in Germany, calmly accepting situations that cannot be changed is part of the system of general attitudes of adaptation, the formation of which is an indispensable condition for the correct development and the evolution of the personality.

The subjective principle potentially exists in everyone: it is the choice whether to be free or not, the choice between living as a subject of your life or as the object of other people's influence.

Societies that try to maintain control over the situation will always be interested in making their members objects of influence. People-as-objects have a tense and sometimes hostile attitude towards those people who can be considered as the actors of their lives, because their independence and autonomy puts them beyond the control of the surrounding environment. People-as-objects will always try to turn others into the same objects of external influence.

The subjective principle will never cease to exist. The dialectic of life consists of the continuous choice that we have to be free or not, dependent or independent. This choice is based upon the intrinsic right of the human being to be what he is. The guarantee of the conservation of the subjective principle relies on the fact that the human being, once he has seized his real and authentic principle, will never renounce it for a stereotyped existence, as easy as that may be. Moreover, that very man knows what it means not to be free, therefore he can really appreciate freedom in a special way.

The merit of Ontopsychology is the possibility of freedom from the limits of the intra-psychic phenomena, and of entering the ontic dimension of human existence. This is what makes Ontopsychology an authentic psychology for human life. Psychological practice, limited to psychotherapy and help with problems, must pursue the appreciation of the ontic space. After all, the objective of psychology consists not so much in the description of the subjective reality of man's intimate life, but in the survey and understanding of the relationships between man's inner and external world, which constitute a human being's whole reality. Only in understanding this can we provide psychology with the possibility of resolving the fundamental problem: that of offering knowledge enabling man to achieve the aim that, in the end, we all pursue: *to learn the art of life.*

Notes:

"Memetics is an attempt at composing an onthological connection between phenomenological behavior and subjective objectivity … The discipline of memetics has not so far acquired the true status of science though it is expected to be a general theory and a formal and predictive model of the relevant aspects of the origins, interactions, mutations, growth and disappearance of memes, as well as their modalities of diffusion".

"Onthopsychology is the science of the future as it is a basic knowledge for the universe of the coming centuries".

"Meme" indicates an elementary unit of information with the ability to repeat or multiply in parallel or similar systems – unit for a infinity of connections

… The most complete definition is probably the following: an idea that, once positioned in a hosting brain, influences the course of things with the aim of creating other copies of itself, which will be hosted by other minds.

"According to the fathers of memetics – Richard Brodie and Richard Dawkins – the winning memes, in the end, always refer back to four primary biological drives in our brains: fight, escape, nourishment and coupling".

"Onthopsychology and Memetics". Antonio Meneghetti and Various Authors, Rome, Italy, 2003, pp. 352-358.

Check up for comprehension

1. What does the author consider to be the history of human society?
2. What is meant by "ancestors' laws"?
3. Do we live according to them?
4. What does the author define as "the pressure of social reality?"
5. What way, according to the author's opinion, can we characterize the basic necessities of a person in a modern society?
6. What is of vital importance for our systems of social adaptation?
7. Why should we overcome "fear of change"?
8. Why is it so important for a person to be capable of self-determination?
9. In what terms or categories can self-determination be defined in contemporary psychology?
10. What is the author's definition of the subjective principle?
11. Why are "people-as-objects" opposed to "people-actors of their lives"?
12. What does the author believe to be the fundamental problem of modern psychology and ways of solving it?

Oral communication

Is it difficult to learn the art of life? – Give your own opinion.

***TEXT 9.* Read the text and be ready for a comprehension checkup**

LIFE STYLE

A lot of this playing with words reflects Adler's groping towards a really different kind of personality theory than that represented by Freud. Freud's theory was what we nowadays would call a reductionistic one: He tried most of his life to get the concepts down to the physiological level, although he admitted failure in the end, life is nevertheless explained in terms of basic physiological needs. In addition, Freud tended to «carve up» the person into smaller theoretical concepts — the id, ego, and superego — as well.

Adler was influenced by the writings of Jan Smuts, the South African philosopher and statesman. Smuts felt that, in order to understand people, we have to understand them more as unified wholes than as a collection of bits and pieces, and we have to understand them in the context of their environment, both physical and social. This approach is called holism, and Adler took it very much to heart.

First, to reflect the idea that we should see people as wholes rather than parts, he decided to label his approach to psychology individual psychology. The word individual means literally «un-divided».

Second, instead of talking about a person's personality, with the traditional sense of internal traits, structures, dynamics, conflicts, and so on, he preferred to talk about style of life (nowadays, «lifestyle»). Life style refers to how you live your life, how you handle problems and interpersonal relations. Here's what he himself had to say about it: «The style of life of a tree is the individuality of a tree expressing itself and molding itself in an environment. We recognize a style when we see it against a background of an environment different from what we expect, for then we realize that every tree has a life pattern and is not merely a mechanical reaction to the environment».

Check up for comprehension

1. What way is Freud's life style theory explained?
2. Whose writings was Adler influenced by?
3. What is the essence of Adler's individual psychology?
4. What does life style refer to in his view?
5. What exactly did he have to say about it?

Oral communication

Comment on: "Life style refers to how you live your life, how you handle problems and interpersonal relations".

Sociology is one of the related fields known as the social sciences. They share the same subject matter: human behaviour. But sociology is the study of social relations, and its primary subject matter is the group, not the individual.

***TEXT 10.* Read the text and be ready for a comprehension checkup**

SOCIAL STRUCTURE AND INDIVIDUALITY

The assertion that human behaviour is socially patterned often provokes some initial resistance. Few human beings readily admit to being part of any kind of system, especially those who live in a culture that prizes individual autonomy. Americans, for instance, tend to emphasize individual responsibility for behaviour and highlight the unique elements of their personalities. Behaving in patterned ways, however, does not threaten our individuality. On the contrary, individuality is encouraged by social structure.

First, and more generally, our humanity involves much more than physical existence. The great potential of human beings develops only through interaction with others. Within social life, distinct personalities emerge as people blend their unique qualities with the values and norms of the large culture from freely expressing ourselves. The social world can be disorienting, even frightening, to people who do not know the behaviour guidelines. Without this knowledge, people feel too uncomfortable to express their unique personalities with confidence.

To illustrate, you may recall going alone to a party given by people you did not know well. Entering such a setting — and not knowing quite what to expect — is likely to cause some anxiety. At such times you generally feel self-conscious, try to make a favorable impression, and look to others for clues about what sort of behaviour is expected of you. Once you understand the behavioral standards that apply to the setting, you are likely to feel comfortable enough to «act like yourself».

Of course, social structure also places some constraints on human behaviour. By guiding bahaviour within culturally approved bounds, established social patterns discourage behaviour that is culturally defined as unconventional. Traditional values and norms in the United States and Canada, for example, still reflect the expectation that males will be «masculine» (physically strong, self-assertive, and rational) and the females will be «feminine» (physically weak, self-effacing, and emotional). The structure of society exerts pressure on individuals to fit into one or the other of these categories, ignoring the fact that most people have both «masculine» and «feminine» qualities. In this and many other ways, social structure can limit any individual's freedom to think and act in ways that may be personally preferred. In addition, the failure to conform to established social patterns may lead to being defined by others as deviant.

Check up for comprehension

1. Why do we say that social interaction is patterned?
2. What does culture provide?
3. So, according to what is our behaviour patterned?

4. What may this assertion provoke?
5. Does behaving in patterned ways threaten our individuality in any way?
6. Through what does the potential of human beings develop?
7. In what case do people feel uncomfortable?
8. What do you feel in an unfamiliar situation?
9. What does social structure place on human behaviour?
10. What is understood by unconventional behaviour?
11. What pressure does the structure of society exert on individuals?
12. What can social structure limit?

Oral communication

Prove the following statements:

1. Social interaction is patterned.
2. Culture provides guidelines for human behaviour.
3. The human behaviour is patterned according to cultural norms.
4. Behaving in patterned ways does not threaten our individuality.
5. A great potential of human beings develops through interaction.

TEXT 11. Read the text and be ready for a comprehension checkup

WHAT I REQUIRE FROM LIFE

(J. B. S. Haldane, a famous biochemist. Great Britain, 1940, an abstract)

I have got to accept the universe as it is. I must not require the impossible, and I shall do harm rather than good if I try to imagine perfect beings in a perfect world. But given the world as it is, I can say what I may reasonably hope both for myself and for others.

I was born in a peaceful age, and in my youth I looked forward to a life of peace. Since 1914 I see no prospect of surviving into another epoch of peace and quiet. So I must try to make the best of the time in which I live. What do I ask for myself? I assume that I have food, water, clothes, and shelter.

First, work, and a decent wage for my work. Aristotle defined happiness not as a sum of pleasures, but as unimpeded (continuous) activity... I want work which is hard but interesting, work of which I can see the fruits. I am exceptionally lucky because I can choose my work to a large extent. If I want a respite from science I can go and be a war correspondent, or write children's stories, or make political speeches.

I require health. I don't mind an occasional toothache or headache, or even an acute illness every seven years or so. But I want to be fit for work and enjoyment in the intervals, and to die when I can work no longer.

I require friendship. Particularly I require the friendship of my colleagues and comrades in scientific and political work. I want the society of equals who will criticize me, and whom I can criticize. I cannot be friends with a person whose orders I have to obey without criticism before and after, or with one who has to obey my orders in a similar way. And I find friendship with people much richer or poorer than myself very difficult.

Check up for comprehension

1. What way has Haldane got to accept the universe?
2. What does he assume to have ?
3. What does he ask for himself?

Oral communication

Do you agree with Haldane's idea: we must try «to make the best of the time in which we live».

TEXT 12. Read the text and be ready for a comprehension checkup

IS THERE A SECRET OF LONG LIFE?

Mankind has been seeking to unravel the mystery of long life for more than a millennium, with hundreds of hypotheses and theories being suggested. It has become evident that long life comes from a whole set of factors, such as purely genetic, but also biological factors and, of course, successful social adaptation. Whereas until quite recently long life in the scientific community was the subject of close attention for gerontologists alone, in recent years, biologists, ethnographers, ecologists, psychologists and sociologists have also joined in with the research.

The distinctive feature of their approach is that rather than examining individual centenarians, the scientists today study entire populations, i.e., large groups, among whom many people have lived long lives, and what is most essential, long lives in these groups have become a regular occurrence in the course of history. Scientists compare «long-living» groups with control populations with shorter lives in the vicinity.

Today's centenarians are people who were as a rule born and lived in one place, without going anywhere, without changing either habits, occupations or diets. Moreover, it has been discovered that the studies played down the role of the psychological factor. We call it «a psychic health factor». It deserves special attention and can prove to be one of the main reasons for longevity as a regular occurrence. What is it?

In the first place, this is what we describe as the gerontophile atmosphere, a socio-psychological situation of marked respect for the old people. This undoubtedly has a favourable effect on the tonus and optimistic mood among the elderly and maintains their interest in life and longevity as a whole.

Secondly, and this is even more important, there are anti-stress attitudes incorporated in society. These are mutual relations which are designed to relieve stress both among individuals and whole groups. The strong family and kinship have a strong positive effect, especially in dramatic situations following death or illness. In other words, we must live without stresses.

So anti-stress behaviour is perhaps the most important thing. With time this will enable the geneticists to extend the natural life span. However, we should not really pin our hopes on this. A comprehensive study of longevity can help scientists not so much to increase the time that any human being spends here on Earth, as to prolong his active life which is worth living as much as possible.

Check up for comprehension

1. What factors influence our life?
2. What scientists are interested in the problems of long life?
3. How do they organize their research?
4. What people comprise today's centenarians?
5. What factor plays a leading role in longevity?
6. What is this factor called?
7. What is meant by the gerontophile atmosphere?
8. What attitude should be incorporated in society?
9. What is the aim of geneticists?

Oral communication

Give you arguments:

1. It is quite possible to live a long life.
2. Only genetic factor plays a main part in the life span.
3. In stressful situations we become strong and healthy.
4. It is necessary to create a socio-psychological situation of mutual respect.

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