Frost with a gesture, stars the waves
that dance
And wandering loveliness. He leaves
a white
Unbroken glory, a gathered radiance,
A width, a shining peace, under the
night."

This then is the poetry of the age which has seen war at its worst. This is a poetry suffused with a chastened and refined feeling of self-surrender at the altar of one's mother-land. T. S. Eliot's "Wasteland" reveals to us an age of disbelief, disillusion, when the poet has to recede to a world of procate associations, when there is no faith, no anchorage anywhere. We may well call it the poetry of a spiritual crisis. Leavis has said that poetry should express "A modern sensibility, the ways of feeling the mode of experience, of one fully alive in his own times." In modern poetry, on the other hand, man does not live intensively but drifts on life, a rudderless boat or acts like a robot without a will of his own. The cosmic vision of a poet like Dante, Milton lies disintegrated in a modern poet.

Poetry epitomises the hopes and fears, joys and sorrows of an age or a generation. It purges the human mind of the baser and meaner feelings of hatred, jealousy and ill-will. Our age has its own complex problems which can be reflected through the medium of poetry only if it is shorn of all ornaments, colour, music and harmony. In the modern consciousness, there is a constant and variegated awareness of the Victorian mind. Above all, there is a confusion and a tension in the modern poets trying to find expression through far-fatched similies and metaphors, esoteric hints and suggestions, startling images and retrospective 'Close-up'. Graces of style and thought which we associated with poetry have yielded place to psychology of the unconscious or sub-conscious mind. T. S. Eliot in his poem 'The Preludes' says:

I am moved by fancies that are curled
Around these images, and cling:
The notion of some infinitely gentle
Infinitely suffering thing.

The values of science which are making inroads into the hallowed field of poetry are leading towards doubt and criticism. The modern poet has lost faith in himself, in the world around him. The poet has started questioning, doubting, examining and clarifying; things which are suited more to the medium of prose than poetry.

Modern poetry is rooted in an opposition to Romanticism and Humanism. Wordsworth's theory is replaced by T. S. Eliot saying "Poetry is an art, not a dumping ground for emotions." The fore-runner of this new school of poetry said, 'Poetry is neither emotion nor recollection, nor, without distortion of meaning, tranquillity.'

Even reason is deposed in fovour of a life of instinct. The new interest in Psychology and Freudian theories, the significance of forgotten memories and repressed instincts, mostly sexual, is exploited for poetic purpose.

Even the poetic diction the modern poet uses is different from the one used by his predecessors. He uses the common language of the high class society. His language is extremely simple and can be followed by labours and farmers. Old archaic words are no longer in vogue. Direct and simple language is generally used. The modern poet has no particular regard for rhyme and metre. Verse rhythm is replaced by sense rhythm. The extreme tendency of the nature of revolt against 'Rules' reaches its climax in the experiment of free verse.

It is bold, unconventional, slipshod ...., even inelegant from the aesthetic point of view. Poetry at first today looks like "A tale told by an idiot full of fury and sound signifying nothing." But on deeper thought, we come to know that the modern poet is only trying to create or seek new experiments, non-discoveries of science. New psychical and symbolic connections are forged in place of logical arguments through words etc. In this at least, the physicist and the poet are at one. If we adopt the scientific attitude of accepting change as the dynamic condition of life, we can certainly find some meaning in modern poetry. It is wrong to say that modern poetry has declined in modern times ; rather it has received a new orientation, a new depth of meaning, a new dynamic urgency.

Modern poetry, which is undoubtedly the poetry of realism is the real mirror of the 20th century. It analyses our politics, our ideology, our economic system. The poetry today is not the poetry of sunset, nor the twilight, nor of cloud ; it is the poetry of his struggles, his labour, his misfortunes. "The theme of the modern poetry is not a flower or a vale, but 'Bread' and 'Butter'. It describes the clash between labour and capitalists, between the 'Haves and the Havenots', between Anglo-American Imperialism and Russian dictatorial communism. Modern poetry chiefly gathers materials from the factory and labouring girls, the daily routine of black miners. Dream of Romance is shattered by the grim realities of life.

"All life moving to one measure,
Daily bread, daily bread-

Bread of life, bread of labour,
Bread of bitterness and bread of sorrow
Hand to mouth, and not tc-morrow."

(Gibson)

Modern English and American poetry has its axis of thought in a coal mine of Lancashire or Ohio, in a steel factory of Birmingham or Toronto. It rotates round the life of the labourers, their demands for more wages, strikes, sabotages etc." (Prof. Fairbanks).

The poets of today are sincere enough in their vocation. There is the stamp of honesty in modern poetry: 'Poetry is the criticism of life.' It must maintain its contact with life.

Modern poetry-is the reflection of modern life. It is realistic in tone and expresses the spirit of the age. It can safely take its place of pride in the Kingdom of poetry produced from the times of Chaucer to the running days.

'HUNGER'

THE CAUSE OF MILLION'S SUFFERINGS

Sourindra Roy
3rd Yr., Science

Over half of total world population does not get enough to eat. The food available is lacking either in quantity or in quality. Children are the greatest sufferers of hunger and every year quite a number of them die or become sick because the food they get is insufficient from food value point of view. The food has a shortage of proteins. The living children are so weak that they cannot resist any of the children's diseases. This awful condition is by no means new. However, thanks to the scientific researches, we possess today enough knowledge and means to allow us to make foodstuffs available for much more of today's world population. Unfortunately we are not advanced enough to end hunger and the diseases caused by it.

The various countries differ considerably in population and food production. In the U.S.A., for example, population has incressed by 35% since the end of the War. But the food production has also increased by 60%. In India population has increased considerably. Food production has also increased but not to that extent as in the U.S.A. In Japan the production per hectare (2.471 acres) is three to four times higher than in India. In Europe cattle accounts for four times meat and milk than in Latin America or the Near East, seven times more than in Africa and ten times more than in Far East.

In areas with good nutritional condition such as Europe and U.S.A., the consumption of milk and dairy products is on the increase where-as that of cereals (rice, wheat etc.) is on the decrease. In France, for example, the per capita consumption of meat in 1958 was 13 Kg. more than in 1938. Over the same period the consumption of dairy products increased by one third (1/3). In areas with poor nutritional conditions the consumpation of meat, egg and diary products is extremely small.

Many diseases can be attributed differently to malnutrition. Among these are various anaemias, scorbutus, beri-beri and pellagra. Other diseases such as measles, pneumonia, tuberculosis etc. find fertile fields for infection among the underfed. The face of hunger can never be forgotten by those who have seen the numerous victims of "kwashiorker", with their hard penetrating gaze, swollen abdomen and exteremely thin legs. The main cause for this disease is protein defficiency. It is estimated that over hundred million children suffer from this disease.

Despite the fact that causes have been known for a long time, vitamin defficiency diseasesie beri beri, scorbutus and pellagra have still not been wiped out. In addition to the protein defficiency, the mineral defficiency conditions, especially Iron defficieney, are wide-spread.

Throughout the world investigations aimed at nutritional conditions are in progress.. The investigations are mainly concerned with providing protein-rich foods. An interesting example of such efforts is the successful work done by INCAP (Institute of Nutrition of Central America and Panama) which was founded in Guatemala in 1949. Practically there are no cows at all in Guatemala and therefore milk is a very expensive food there. In fact people there do not even like the taste of it. INCAP succeeded in manufacturing a drink called "Incaparina" containing corn flowers, seesame and cotton seeds, green leaves, yeast and vitamin A. The drink is one fifth of the price of milk there, contains as many protiens as milk, more phosphorus and twice as much iron and carbohydrates. The drink is delicious too. Investigations are in progress to make similar drinks in other area using rice instead of corn in Asia and millet inAfrica.

An improvement of nutritional conditions implies first and foremost an increase of cultivab'e surfaces. The expansion of modernisation of fishing is a'so important. More than 70 percent of the earth's surface is covered by water, yet fish, one of the foods most rich in protien, acounts for only I percent of human nutrition. In Japan where fish provides 90 percent of the animal proteins, large sca'e modern fishing projects including the use of atomic submarines are at present being deve'oped. In recent years some new sources of foodstuff have been formed. Curiously enough, of 3, 50, 000 different plants known to man only 600 are used, somehow or the other, as food. Likewise, of the two million species of anima's known to man only 50 are used as domestic animals. The Chinese have known for thousands of years that, as concerned protein contents, soyabean can compete with the meat. Soy-milk contains as many proteins as cow-milk. When oil-containing seeds such as peanuts, cotton seeds, seesame seeds, sun. flower seeds etc. are pressed, the solid cakes that resu'ts is very rich in proteins and could serve as food for man instead of being used as fodder for catt'e or fuel. Sweden is a'ready far advanced in the production of fish flour which can be used as supp'ements to other foods. Fish contains more than 85 per cent proteins. In the Far East especially in Thailand, P'ankton (the forms of floating organic life found as the surface of lakes, taken collectively) yie'ds an average 15 tons of fats. Ch!orella-the algae of fresh water may a'so be used as protein rich foods. One hectare yie'ds 44 tons a year which is equiva'ent to 10 harvests of cereals. This-algae contains of 6 times more proteins than rice, 30 times more vitamin than in catt'e liver and 4 times more vitamin A than in Spinach, which it resembles in taste.

Thus we see that mother Earth has rich stores of substances which can serve as foodstuff for the ever increasing population. Science and technology have tackled important prob'ems and have succeeded in providing preitn-rich substances as va'uable additions to meat and dairy products. In spite of this we are still in the early stages of our fight against hunger. Modernisation of the method used in agricu'ture and fishing, increase of fish consumption, the deve'opment of new protein rich foods, rationa'isation of food distribution system and exc'usive food eduatconal camapigns are among the main tasks, facing U. N. O.'s Foo dand Agriculture Organisation which works in c'ose contact with Wor'd Health Organisation.

A Centenary Tribute to C. R. Das

Subrata Chowdhury
2nd Yr., Science

"এনেছিলে সাথে করে মৃত্যুহীন প্রাণ,
মরণে তাহাই তুমি করে গেলে দান।"

Deshabandhu C. R. Das was a unique personality in the political horizon of India.

He was born in Calcutta on 5th Nov. 1870. He died on the 16th June, 1925. His political and public life was only for a period of six years and no statesman has done more for a nation in such a short time.

His paternal home was in the district of Dacca, now in East Pakistan. His father Bhuban Mohon Das was a well established attorney. Chittaranjan School life was spent in a London Missionary School at Bhawanipore, Calcutta. He graduated from Presidency College. After graduation he started for England in about 1890 with the primary object of qualifying for I. C. S, but ultimately returned as a Bar at Law.

From his school and college days Chittaranjan became well known as a fine debator and orator.

He had difficult days of struggle at the Bar. As a junior at the Bar it was difficult to make both ends meet. But Chittaranjan struggled with iron determination.

Good fortune smiled on him at the Bar. Within a very short time, he had a large and lucrative practice at the Bar and he was in great demand in many courts. He had a good voice and a persuasive delivery. His command over the language and his choice of expression were most interesting. Those who heard him in courts and out side could not forget his words.

The political condition of the country at that time was surcharged with patriotic and national ambition for self-government. At that time Swadesi movement was prominent in Bengal. It was a great movement whose object was to achieve economic, political and cultural independence for India. The Indians who took part in the Swadesi movement were prosecuted by the British Govt. It was Chittaranjan who gave shelter to those Indians without charging any fees. His service in this direction increased his fame and reputation as a great lawyer.

In the year 1921, while the Non-Co-operation Movement of Mahatma Gandhi spread through-out India, Chittaranjan engaged himself in that movement. In a moment's notice Chittaranjan left his practice, his topmost position at the Bar, luxury and prosperity and joined the national movement. He left his princely house and his luxurious habits. He became a Fakir and stood beside the common men of India. Gandhiji named him "Deshabandhu", the Friend of the Country.

Chittaranjan Das, his wife Basanti Devi and his sister Urmila Devi went to jail with a smiling face. Chittaranjan became the founder of the new political party called the "Swarajya Party". Swarajya Party captured the imagination of the people. Chittaranjan was responsible for the publication of an English daily newspaper named "The Forward." "The Forward" was one of the leading papers at that time. He was the first Indian Mayor of Calcutta Corporation. He was responsible for the setting up of many free primary corporation schools for the education of the city. He was one of the finest poets in Bengali language. He was the author of about five books of poems in Bengali. A lover of Keats, Shelley and Browning, he was also responsible for bringing out a monthly Bengali magazine, called "The Narayana." "The Narayana" was one of the best Bengali monthlies at that time.

Chittaranjan Das died in Darjeeling on the 16th June, 1925. The whole country was shocked by the news of his premature death. The entire nation broke down in grief when his dead body was brought to Calcutta from Darjeeling. On his death Rabindranath Tagore wrote that Chittaranjan brought with him a deathless life, by his death he distributed his deathless life to the nation. Gandhiji also described Deshabandhu as a "Hero of hundred battles."

After one hundred years of his birth, we pay him our respectful centenary tribute to keep his memory to inspire us to new destinies of the new age.

—O—

'CAN A MINERAL AGE BE STABLE ?'

Rupagosai Sinha
3rd Year. Science

The progress of man in civilization from the barbaric stage has been punctuated by his mastery over minerals and metals. Ever since the emergence from the 'Neolithic', pursuit for metals and the developments of metallurgy have been the key-stones of his economic welfare and industrial progress. Tools made directly or indirectly out of metals and munitions (now supplemented by atomic weapons) depend largely on the product of mines. Minerals have thus occupied one of the modern world's important resources in the support and fulfilment of human life.

Throughout the geological ages, the mineral resources were preserved in the earth's crust as a secret wealth. In the present century this wealth plays a very great role in every department of progress. The so-called civilization in the past and preceeding decades, therefore, can be called the 'Mineral Age.'

A nation's progress and power potential are largely measured in terms of its mineral wealth and its ability to explore, systematically, process, policy and planning of mineral developments and use it to the best advantage. There are roughly about 2,000 species of known minerals in the world and of these barely 200 are of direct use in man's pursuits. The advancing technology of the last decades has brought into use an increasing number which finds application in commerce, industry and arts of today. For practical purposes every country looks at its mineral resources from the view point of its surpluses, sufficiencies and defficiencies. Today every great world power assesses its mineral potential from the view point of military strategy and internal defence ; stocks of piles of defficit strategic minerals are built up against possible eventuality of aggression.

There is a mounting list of minerals and metals, which are brought into use in the manufacture of weapons, of national defence ; these are rapidly growing piles of new atomic weapons, jet-propelled engines, rocket-planes, space-explores and their highly specialised electronic accessories. An immense range of new metallurgical products, ferrous, non-ferrous and light metal alloys falls in the category. The most important minerals in present-day planning are, therefore, the essential and basic minerals and metals which are on the industrial and defence programme of a nation. These are stock-piled and earmarked for defence emergency and are regarded as minerals of prime importance. The second category includes, besides raw materials, non-metallic minerals like mica, kyanite, graphite, etc. and ores of rare metals, which feed the modern specialised industries. The third group comprises all the metallic and non-metallic natural products which supply the needs of daily life and international commerce and communications. In this way, the mineral resources have developed a powerful progress in the industrial race of the 20th century world.

It is this very civilization that has caused enormous depredations on the stock of minerals in the accessible parts of the earth. The very wide range of their uses has made great inroads on the world's stock of minerals, in some cases to such an extent that their assessible stocks in the earth's crust are reaching depletion point. The question arises whether in the coming centuries, the reduced minerals supply position will affect, and to what degree, man's industry and well-being.

In this depletion of the earth's stock of minerals, wars have played the biggest and the most sinister part ; because, the wars of the present century have used up, or destroyed or put out of action more basic metals and minerals than were consumed during the whole course of human history. The diminishing reserves of such minerals as lead, tin, zinc, copper, nickel and eventually of petroleum and coal, have called forth warning notes from geologists and industrial economists. But it is evident that in spite of these, the tempo of consumption of minerals is steadily rising and will increase to such an extent before the 20th century closes, that mankind will be confronted with problems of replacement of some exhausted minerals by non-mineral products, such as plastics, glass, ceramics etc. The impending scarcity can be put off for a few generations to come by such measures as substitution of plastics and light metal alloys which are in more abundant supply together with new discoveries of mineral reserves in hitherto unexplored territories of the world and resort to such means as deeper mining and refining of sub-standard raw minerals and ores.

But the lesson of mineral depletion from the accessible parts of the earth's crust should be taken as nature's grim warning that modern man is spending away a prime potential of earth which is non-replenishable. How this will affect the trends of world progress and our nations, of civilization eventually, or in what manner human ingenuity, science and technology will answer the situation seems unpredictable at present. But, India, sooner or later, depending on its surpluses, sufficiencies defficiencies and the planning of it all, will have to share the world trends. Till such an eventuality arise, the intervening years will bring into prominence in India, as in the rest of the world, atomic minerals, uranium, thorium, lithium and a number of sub- ordinate mineral substances required as fuel or as moderator or reflector in nuclear reactors, or in fabricating of structural or shielding atomic parts of reactors. Harnessing of this new energy source for industrial power within near future to replace the dwindling coal and oil and such resources, requires no prophetic vision. This developing phase of human endeavour is bound to be integrated with future civilization. The world's resources of uranium are not scanty and will be supplemented by thorium in the near future. Further, accelerated by current strides in nuclear physics, research will facilitate more and more the employment of nuclear fuels in preference to fossil fuels. This will relieve the pressure on the depleting world reserves of coal, petroleum and natural gas which, according to geological belief, will not at the present rate of consumption, last for more than 8 to 10 decades even in the parts of the world best endowed with these, e. g. the Middle East, U. S. S. R, Sahara, China and the U. S. A.

From the world's mineral map, we see that while India has reserves of great importance in iron, manganese, aluminium, titanium and mica, the number of deficiencies is also considerable, in some respects even serious e. g. in some petroleum products, tungsten, mercury, tin, lead, nickel and potash. In the former group India occupies a commanding, if not a controlling, position ; in the latter, her position is one of dependence on foreign imports, though in some cases (e. g. petroleum, copper and sulphur) the situation has somewhat eased recently. There is an intermediate group of minerels in which India is self-sufficient for the present and the immediate future. Bearing in mind this disequilibrium, a balanced development has to be planned on a nation-wide basis for peace and of international disturbance. A healthy dependence on our mineral resources has, therefore, to be planned on a pattern similar to that of the U. S. A. in post— War years. However planned the programme of mineral development may be, a time will be reached when there will be no minerals left in the humanly accessible parts of the earth. The duration of the "Mineral Age" itself in human civilization will depend on the rate at which it reaches the exhaustion point of the mineral resources. Distant future will recognise the "Mineral Culture" of the present age as a passing phase of human civilization and the science of mining as an ancient science. Its literature and technique will be looked upon by posterity as a phase in the sum total of man's knowledge in a bygone age.

It is sad to imagine that if the substitutes for the vanished minerals and metals prove more handy and effective the very science of present day mineralogy and the mining techniques could be patronisingly described as laborious processes of a halfcivilised age in building up human welfare—awelfare which they themselves destroyed by depleting the mineral through over-production. If, however, on the other hand, the world of the future is destined to be handicapped by the absence of minerals and if it finds their substitutes hard to win and not serviceable enough, when won, according to contemporary standards, the age of minerals will be immortalised as the golden age of human civilization with utmost reverence to the savants who knew the great science and with a degree of admiraton which might well outstrip those who created long lasting monuments of the world, snch as the Iron Pillar of Delhi and the Pyramids of Egypt.

[In preparing the article help has been taken from the book, 'Economic Geology' by Wadia. —Author]

* *

CHEMISTRY OF THE "GENETIC MATERIALS."

Prof. D. Ghosh.

It is a well known fact at present that the materials over which the genetic code is due are two nucleic acids-Deoxy ribonucleic acid (DNA) and Ribo nucleic acid (RNA). DNA occurs only in the nucleus of a cell whereas RNA may occ ur iu the nucleus but occurs mainly in the cytoplasm. Very little of these two acids lie in the free form but are found mostly in combined form with proteins and the combination is known as nucleoprotein. The DNA— nucleoproteins contain usually forty to sixty percent DNA and the RNA— nucleoproteins contain five to twenty percent RNA. The protein and the nucleic acid donot lie in the easilv separable state. In order to recover one of them, say the nucleic acid, the protein portion is to be completely destroyed and vice versa.

Meischer (1868) was the first man to separate the nucleic acid from the pns-cells by digesting them for weeks with dilute hydrochloric acid. He shwoed that the nuclear material contained an unusual phosphorous compound of high molecular weight. He considered the product to be the essential constituent of all cells and termed it nuclein. It possessed much stronger acidic properties than proteins. Henceforth thousands of workers found out a lot of answers of their quiries and it was established that the nucleic acids are fundamentals of a gene and are the controlling agents of protein synthe. sis in a body.

CHEMISTRY of DNA & RNA.

The DNA and RNA are very similar from the chemical point of view. Both are long chain compounds of high molecular weight, having a series of monosaccharides (pentose) joined to each other through phosphate bridges. Each of this sugars in both the acids are attached in the side chain with bases which are purines or pyrimidnes. The essential difference between the two is— DNA consists of two long chains whereas RNA possesses a single, and sugar present in DNA is deoxy ribose, the same in RNA being ribose. DNA possesses a much higher molecular weight then RNA, The bases which are attached to the acids are Adenine; Guanine, Thymine; Cytosine and Uracil, the first two are purine and the remaining are pyrimidines The DNA :— The DNA molecule is composed of two long chains, each chain in turn possesses alternate residues of sugar (deoxyribose) and phosphate. The bases are attached to the sugars. The chain is of the type—

```
      Adenine               Guanine
         |                     |
—phosphate-De-oxy—phosphate Deoxy—
      ribose                ribose
      Cytosine              thymine
         |                     |
—phosphateDeoxy phosphate-Deoxy—
      ribose                ribose
```

In usual practice the chains are shown as-

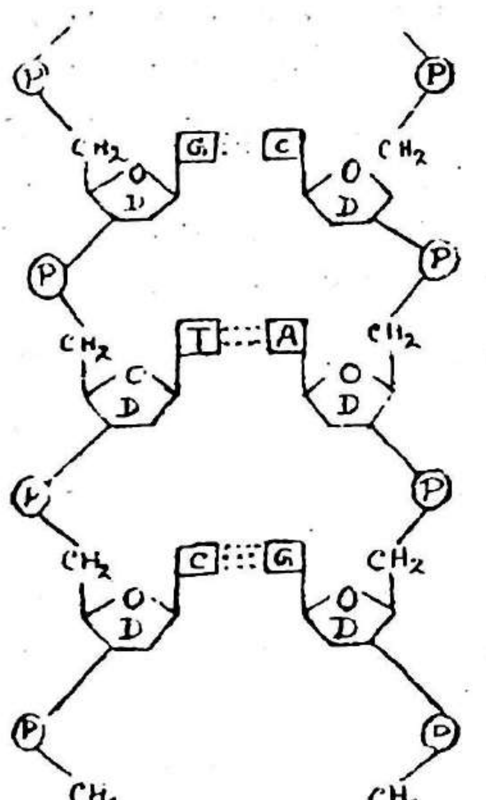
-p—dA—p—dG—p—dC—p—dT—p— etc.

where p stands for phosphate, d stands for Deoxy ribose, and A, G, C, T, for the baes Adenine, Guanine, Cytosine and Thymine respectively.

The two chains DNA are complementey to each other and are attached through the bases by means of a type of bond called hydrogen bond. There lies a strict specificity among the linking bases of the two chains, such that 'A' of one chian pairs with 'T' of the other chain and vice versa. Similarly 'G' of one chain pairs only with 'C' of the other chian and vice versa. So the actual picture of DNA is of the type—

```
—p—dA—p—dG—p—dC — p — dT — p
    |      |      |        |
—p--dT—p—dC—p—dG — p — dA — p
dG—p—dC—p—dT—p—
 |     |     |              etc.
dC—p—dG—p—dA—p—              1
```

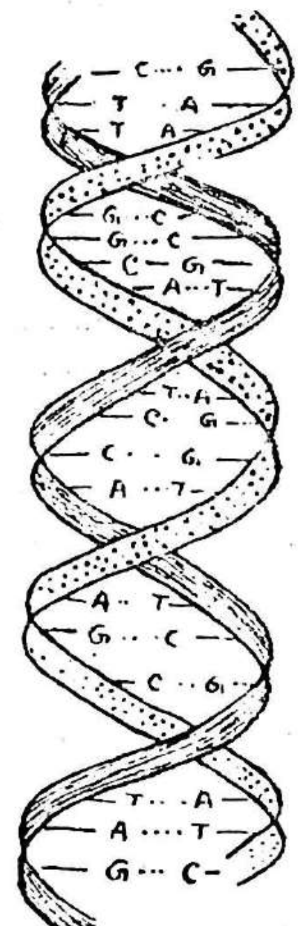
Another important thing to be mentioned here that the bases present in both the chains lie in a plane which is at right angles to the plane of the phosphate-sugar chains, i. e, the bases link with each other in a plane perpendicular to the plane of the mother chain. The two long chaines donot lie in a straight line, but in a spiral from, i. e, forming a helix and the bases lie in between. This was known and confirmed from the x-ray diffraction studies (Watson & Crick 1953). Very recently it was further found that the helix form is visible electron microscopically (Griffith & Bonner 1969). Structurally the DNA molecule may be represented as—



D-De-oxyribose
(FIG-A)

with a sreies of sugar (ribose) and phosphate units in an alternate fashion. Like DNA, in RNA also the bases are attached to the sugars in the side chain. But in RNA the exception is that the base Thymine is replaced by another base Uracil, which is not present in DNA. So a RNA chain can be shown as-

Helix from
FIG - B



The RNA.— It is already mentioned that RNA consists of single long chain

— P — rA — P —rG — P — rU —P-
— rC — P — rU — P — rA — etc.

Where 'r' stands for ribose. In actual practice of writting RNAs the 'p' and 'r' are omitted. So the above chain is shown as—

A G U C U A.... etc.

In synthesisng protein in a living body three types of RNA are to collaborate, viz,— messenger RNA (m RNA), ribosomal RNA (r RNA) and soluble or trans. fer RNA (t-RNA).

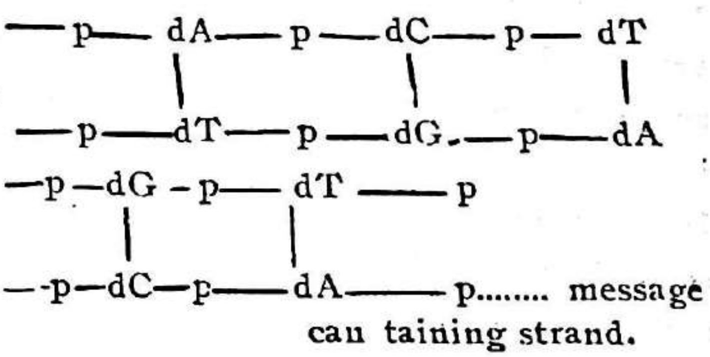
Nucleosides & nucleotides :— RNA or DNA can be hydrolysed with acid or enzymes to yield the basic building stones. If the breakdown is stopped before it is complete, nucleotide and nucleostides are obtained.

Nucleic Acid $\xrightarrow[\text{enzyme}]{\text{acid or}}$ Nucleotide (base. sugae phosphoric acid)

$\xrightarrow[\text{enzyme}]{\text{acid or}}$ Nucleoside. (base sugar).

The Genetic Code :— A man inherits the genetic materials from his father and mother. From the chemical point of view he inherits the DNA from his parents. The DNA can duplicate itself and the molecule can pass on to the offsprings. That is how the heredity is maintained. The DNA maintains the heredity, i. e, the genetic order, through protein synthesis in the body. Proteins are long chain compounds of very high molecular weight being csmposed of twenty or odd amino acids linked in series. In a protein of molecular weight 100.000, about 1000 amino acids are present and these are arranged in a particular sequence to produce a particular biological order. Any change in the sequence will result in the difference in the biological order. The same sequence in the protein structure passes from generation to generation and the formation of protein in the offsprings is guided by the DNA by the system known as genetic code. The DNA of course does not take part in the protein synthesis directly. They send their message through a class of RNA molecules called messenger RNA (m-RNA) to the ribosomal site of protein synthesis.

The synthesis of m-RNA takes place in the double stranded DNA chains. The base pairing rule takes place in one of the strands of DNA which contains the genetic message It goes as—



The m-RNA is A C U G U.... .... etc.

It is clearly seen that wherever the message containing strand has 'G' the RNA gets 'C' and vice versa. Similarly in place of 'T',m-RNA has 'A', but in place of "A" it is not having "T", But another base Uracil (U). So it is seen that m-RNA is a complementery copy of one of the strands of DNA with the only exception 'T" which is replaced by "U."

The m-RNA collabortes with the r. RNA to align the amino acids supplied by the t RNA, in the correct sequence as directed by the DNA.

The actual process can be shown as—

DNA ---translation---> m-RNA ---transcription---> Protein.

Thus it is seen that the amino acid sequence in a protein is determined by DNA. The information of the sequence lies only in the arrangement of the four bases which has got an immense number of possibles of sequential arrangement. It was shown and proved that an arrangement of three, a triplet code is existing, i.e., an arrangement of three bases stands as a symbol of one amino acid. Each of this triplets are commonly called as codons. There are four bases, so the triplet code shows the possiblity $4 \times 3 = 64$ different arrangements but there are only twenty amino acids. So first it was thought that out of these sixty four, only twenty are valid ones. But latter it was found that the case is somewhat different, an amino acid is are represented by more than one codon. This can be explained as such · let us take one hypothetical m RNA where the bases are say A, B, C and D. Let the RNA is

ACDBDCDDABCABCCDBC....... etc.

According to the triplet rule the first three bases ACD will stand for one amine acid say a1, the next triplet BDC for say a2, the next triplat for a3, etc. So in the formation of the protein the aminids will be arranged as—

a1 — a2 — a3 —a4—.... ....etc.

by maintaining the same sequence as brought by m-RNA.

The pieneers in the field are R. H. Holley and Marshall Nirenburg who shared the Nobel prize with khorana. Nirenburg and one of his collegue John Mathei were the first to break the genetic code. They first found the technique of detecting codons for a particular amino acid by using artificial m-RNAs. Nirenburg was then supported by Ochoa to detect more codens for individual amino acids. Latter Nirenburg devised a more elegant and useful technique for determining the coding system. The method is known as "Binding Technique" and Khorana made full use of it to achieve the grand success in determining the codons for different amino acids and putting the world in the thought of controlling the gene by controlling the order of the amino acids in protein formation.

....ooOOoo....

[*It is a part of the lecture delivered by the author at the seminar arranged on the topics "DNA its role in life," at Arya Vidyapeeth College*].