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[POEM]

Thiefs of the world arise !

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This age of actor and benefactor
Purrs and purrs but does not spur.
A genuine thief is what we need
The iron-age benumbs his creed.
Bandits at large ! the thief recedes
The actor preaches, and none heeds,
The actor snatches smile with-al,
And imparts it, it does fall.
The thief not snatches, but doth steal,
And imparts it and we feel,
Feel because we proudly steal.
What is stolen does but heal,
What balms and spur is creed of thief
From that come peace, salvation chief.
Its balm is great as that of rhyme,
Which is itself a stealing prime.
Arise yon thiefs of all descriptions,
Ages all, and races, nations ;
Steal and delever goods in fog,
Bounce and pounce and clog and dog.

Energy AND India

Nabin Ch. Kalita
Prev. yr. M.Sc. (Maths.)

IN these few pages and with such a meagre knowledge as we possess, it is a very hard task to assess everything that ought to be included in the subject.

India is one of the countries which have yet to solve the common man's fundamental problems of food fuel, shelter, clothing or transport though she has been able to double her food production in the last 28 years primarily because of a tremendous increase in irrigation facilities through the major dams and reservoirs. The life spans of major dams reservoir, however, are only a quarter of what our dams had then meant to be. Heavy silting of our reservoirs is already taking place. Very soon our population at its present growth rate of 2·5% a year will outstrip our food stocks. As regards the future, the declining fertility rate is assumed. During the fifth plan and later, a population of 705 million in 1986 and 890 million in the year 2000, with a growth rate down to I percent only are calculated to be. And to meet fully the rising demands of still growing population, the irrigation commission has drawn up a programme for complete and final development of the countrie's entire irrigation potential, estimated at 82 million hectres by 1989. The rapidly worsening economic situation is forcing the trace of irrigation development to earlier completing but a recent resurvey has put total potential at 107 million hectres, which is not likely to be all developed much before 1994 (end of the fifth plan). There is no question of this programme's ever extending to the year 2000, even if a re-assessment were to raise the potential somewhat higher. The twenty point economic plan announced by the Prime Minister of India in July 1, 1975 also aims to bring five million more hectres under irrigation. National programme for use of underground water is being stressed.

But all our economic plannings for an accelarated development will be doomed if the present energy crisis continues to exist. Various sources of energy in India have so far failled to meet the full requirements of both the agricultural and industrial sectors. This shortage has recently got aggravated further because of a four-fold increase in the international price of crude oil. To take the country out of the present energy crisis, we need to increase the yeild and production of the current sources. As stocks of fossil fuels are depleting at a fast rate and as our energy requirments in the future are bound to be increase with increase in human population with improved living standards; we would have to take the help of other energy sources as well. But before doing so we have to assess the other potentialities of the different sources and would have to solve many related scientific and technical problems.

Energy which is the most fundamental for all kinds of developement at present means a capacity for doing useful (also harmful) works. Forgetting everything those harms that may be caused by use of Energy we should channelise our attention and genuine endeavour to channelise our attention and genuine endeavour to channelise all the energies for the good of our society ; for the good of man. For doing anything like cooking food or travelling from one place to another, we need help of energy. Energy has generally been drawn from three sources : fossil fuels (remains of past organisms lying for million of years underneath earth's surface)— coals, natural gas and oil ; biological sources —wood, cattle-dung and vegetable wastes ; and electricity generated from hydro nuclear and thermal sources. Of these, from whichever we can obtain energy; it can always be converted into more useful and easy-to-use forms using various mechanical devices.

Present sources of Energy ;

Coal :— Total known reserovirs of coal in India are 83 billion tonnes and our everage annual production is 70 million tonnes. This production rate can be inereased with improved mining techonology. With increased coal production, more thermal-power station may be set up. It is a source of oils and gas which may be produced by treating coal under various gasification techniques.

Oil :— Our total known reservorirs of oil are 130 million tonnes. Our present annual consumption of oil is 23 million tonnes, out of which only 8 million tonnes are extracted from our own sources. The left is imported mainly from the Arabian countries, the largest oil producing agents in the world. This rate of production can be increased and with improved exploration techniques, new oil-fields may be located. The recently obtained sources of oil in the Bombay High, Assam and Meghalaya may bridge to some extent the gap between our rate of production and consumption.

Hydro-electricity :—The total electric power which can be gainfully generated from our all water sources in the country is 41000 MW (1 MW=10^6 watts) of which only 9000 MW is being generated at present. Though this source of electricity at times is some what undependable because of erratic monsoon and less rainfall in catchment areas, yet the total potential of this source is tremendous. Out of the currently used sources,

this is the only source which goes wasted if not fully exploited. Yeild from this sources can be more effectively used by decreasing transmission losses which amount to about 20% at present.

Thermal-Power :— When ELECTRICITY is generated by burning FOSSIL FUELS (usually coal) the minimum efficiency of conversion from heat energy to electricity reached is about 40%. The remaining gets lost due to radiation and other factors. This efficiency may be pushed to about 55% by using MHD (Megneto-hydrodynamic) generators which are in the development stage at present.

Nuclear-Power :— Electricity from this source in the country is being generated using the fission [the process of breaking up of nucleus of a heavy atom into two more or less equal segments with the release of a large amount of energy] of both natural and enriched uranium (natural uranium contains only 7% fissionable uranium —235 and the rest is fertile uranium—238, Enriched uranium contains more than 7% fissionable uranium—235)

With the known Uranium deposits and present reactor technology, our generating capacity of electric power from this source can be 5000 MW of which only 600 MW is being utilised at present. Our reactors, along with producing electricity, produce some fissionable Platinium—239 from absorption of fast moving neutrons by uranium—238. Since our deposits of uranium are rather limited, attempts are being made to develop fast-breeder reactors which can use plutonium —239 as fuel.

It has been mentioned already that the atomic fuel Uranium exists in nature in two isotopic forms of atomic weights 235 and 238. It has also been mentioned that it is the less abundant 7% lighter isotope U 235 that undergoes fission by absorbing thermal neutrons. The neutrons released during fission maintain the Chain Reaction. The heavier and abundent isotope absorbs neutrons of certain energies without undergoing fission causing a loss of neutrons thereby retarding the chain reactions. To overcome this, enriched Uranium in which the abundance of U 235 is increased by isotope separation in the atomic reactor fuels and in the atomic bomb. The chemical properties of the isotopes are identical and they cannot be separated by chemical processes. The present method of separation make use of the property that lighter elements diffuse faster than the heavier ones. Since the difference in mass in this case is very small, the process is very slow and so very expensive. Much of the high cost of the atomic fuel is due to the cost of separation. Recently, a few research groups in the west have announced the separation of isotopes by using LASER [meaning : Amplification by stimulated emmission of Radiation. The success of MASER principle in the amplification of microwave frequency range propnpted several investigations to examine the possibilities of extending this principle in the optical and infrared regions of the spectrum. This led to a very useful invention in 1958 of LASER or the optical MASER. The credit for this unique device goes simultaneously to C. Townes and Schawlov of Columbia University, U.S.A. and Basov and Prokorov of Lebedew Institute, Mosow]. This technique when fully developed could greatly reduce the cost of atomic fuel. It is reported [Physics Today, Sept. '74, P.P. 37] that the concentration of U235 in a sample

was increased from 7% to 60% by a group of scientists in the U.S.A. using this technique.

Some other non-conventional sources of energy are wind-energy, geo-thermel energy, tidal energy, sewage garbage energy, which may be of great help to us in stuffing our energy shortage.

Fast- breeder Reactors :- Attempts are being made to develop fast-breeder reactor in India into stages, In the first stage. Plutonium--239 would be used as a fuel, and this would be covered with either Uranium —238 or with thorium—232 as a blanket. In the first case, more Plutonium—239 would be bred then consumed, while in the second case, fissionable Uranium—233 woutd be produced. In the second stage, fissible Uranium—233 would be used as fuel, and thorium—232 as a blanket. This would breed more uranium—233 than burnt. Since we have the largest reserves of thorium—232 in the world, thorium-based fast breeder reactors have a big potential for us. In this regard, it can be mentioned : "The country has at present four research and two power reactors in operation. The research reactors, all at the Bhaba Atomic Research Centre (BARC) are ; APSARA (1 MW), CIRUS (40 MW), Zerlina (zero energy) and Purnima (Zero energy fast reactor). The two power reactors are at Tarapur, Maharastra and Rana Pratap Sagar, Rajasthan, while the two power reactors are under internal security ; Apsara, Zerlina and Purnima operate at very low power levels to be of use for the large scale production of plutonium. This leaves the choice of Cirus. Cirus, built with Canadian assistance, reach criticallity on July 10, 1970. The Canadians handed over the operation and maintanace of the reactor to Indians by the ends of November that year. A notable result of the policy of self-reliance was that Indian Scientists learnt the fabrications of the nuclear-grade natural uranium fuel for Cirus. And the fuel was, in fact, better in quality than those initially supplied by the Canadians.

Before Cirus became fully operational, the decision was taken to build a plant to recover the by-product plutonium from the irradiated fuel rods, and the plant was commissioned by August, 1964. A sophisticated laboratory to analyse the quality of the plutonium recovered was also built" (Science Today, Sept, 1974—Topic : Nuclear Nirmaan)

Fusion Reactors :- Since even nuclear power agencies face the problem of depletion of nuclear fuels sources, scientist have been looking for those sources of energy which may promise a virtually unlimited supply for times to come. One of this controlled reactions [the process in which two nuclei forced to combine to form one] on which work is going on are between deutorium—deutorium and deutorium—tritium (both heavy isotopes of hydrogen). Deutorium is available in oceans in the form of heavy water and may be separated out by electrolysis to an efficiency of 95% to 100% at a relatively low cost. For the fusion reaction to undergo, one needs to continue the combining nuclei for small time (usually a fraction of a second) at sufficiently high temperatures (generally greater than 10^8 k) under very high pressures (greater than 10^{12} atmospheres). Since this is extremely difficult process, attempts are being made to acheive it with the help of powerful laser-beams.

Hydrogen (deutorium and tritium) can be an ideal fuel of the future because of ease in stocking and transporting, safety in

use and its non-polluting quality. On the other hand, when petrol burns in automobiles, carbon-di-oxide is evolved. It pollutes our atmosphere which has become a great problem in the industrial cities. Hydrogen will ordinarily produce water which is not at all harmful. But it is a bit worrying to the ecologists, for the Oxygen will be consumed in large quantities during the formation of water. In fact, hydrogen cannot be used as a source of energy like fossils but as an energy carrier—water being its unlimited source. It is hoped that the researchers would be able to solve various scientific and technical difficulties within a decade or two, and power plants based on LASER FUSION would become operational by the turn of the century.

In the immediate future, our energy requirments can be met simply by increasing the yeilds and searching for new process. Import of crude oil may be lowered by making full use of our hydro-resources and by increasing our dependance on coal. When the use of coal is enhenced creating posing enormous transportation problems, it is hoped that technological advances would enable us to drive enough power from soler-energy (which has been used in Japan already) and fast breeder reactors and nuclear fusion. And even if the fruit of nuclear power does not become a major source of electric generation, we shall be able to able to meet it from hydro-clectricity for long years. The full control of our big rivers with the main tributeries would cost approximately Rs. 530 crores which our nationalised banks can easily finance. If the work is taken under the full use of Military power and guidance the step will be a bit better. In this respact of course, questions may arise regarding the Know-how of our engineers. Undoubtedly, we have a big stock of qualified engineers as Britain, West Germany or France and they will be able to take the responsibility if the work is first taken experimentally then proceed step by step for direct materialisation. Again we have a great deal of man power also. If all these are parallely employed, we may be even able to possess more energy in water than the Arabian countries have in oil. Such a step will improve our irrigation and transportation in many-folds. To speak the truth, it is the unimproved and traditional irrigation system which is responsible for not meeting our demands of food while China having less areable lands than we have meets the demand producing two and one-fourth times of ours. Actually, we can meet our minimum demands and build the edifice of a splendid, self-sustaining economy if we all display a little more energy, enterprise and dedication.

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EARTHQUAKES

Pratul Kalita
B. Sc. (II yr.)

ANY vibration set up within the Earth as a result of natural energy being applied to it is known as Earthquake. In a simple way we can say that it is a jerking motion in the rocky shell of the earth's crust. Earthquake evokes a picture of death and devastation, which terrified mankind for thousands of years. Villages are buried by land slides, fissures opened and spout water, rivers and spring go dry. Like this, earthquake change the Geological history of an area. Earthquake brought disaster upon man, both directly and indirectly, i.e., by causing destructive "tidal waves", Land slides, fires broken water mains. and diseases produced by contaminated water supplies.

Great loss of life has accompanied some earthquake. For example, in September 1, 1923, Japanese catastrophe, approximately 140,000 persons were killed and property damage was estimated at 3 billion dollars.

In elongated belts that coincide approximately with the regions in which volcanoes are or have recently been most active and also with young mountain systems, earthquake tend to be most frequent.

So far we have learned about what is earthquake, but now we are to see how the earthquake is caused. There are many causes for the origin of the earthquakes, The earthquake may cause due to exterior as well as interior causes.

Aristotle believed that due to release of underground air the earth is shaken. Lucretions belived that the collapse of underground caves produced shocks. The present knowledge of the science of earthquake is due to the research of Mallet, Milne, Reid, Imamura, Omori, and others, though there are many things yet to be made clear.

Earthquake may be generated by landslides avalanches in the mountainous regions. But according to Oldham landslides, avalanches collapse of caverns are effects, not causes. Variations of temperature, variation in the weight of atmosphere, variation in the distri-

bution of snow and water dashing of the sea waves against the coast are considered to be minor causes producing slight tremors. These causes are known as surface causes.

During the explosions of volcano the earth tremble locally. This type of earthquake is not generally severe. But, ofcourse some of them may cause disaster locally. The explosion of Krakatoa in Sumatra on 27th August, 1883 is one of the best example of earthquake produced due to volcanic causes.

The main or, so to say most reliable cause of earthquake is the tectonic cause. It is due to the structural disturbance resulting in the relative displacement of the different layers of the earth's crust. The earth's crust is made up of layers of rocks. Due to differential load or stress the rocks are deformed. Rocks are having elasticity. There is a certain limit of elasticity for each rock unit which is known as elastic limit. Some times this elastic limit is exceed by the stress or load above it and a fracture is developed. To

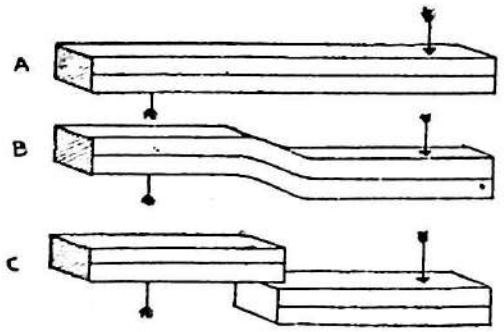

Fig I Elastic rebound theory

reduce the strain the two halves tend to move from each other along the weaker plane and regain their original configuration due to elastic rebound. This is known as elastic rebound theory which was proposed by H.F. Reid. According to him Stresses on two sides of the fault were accumulating and produced bending of rocks. When the rock could bear no more strain it breaks with sudden displacement on eitheir sides of the fault. During its displacement it gives a blow to the upper rocks on one side and to the lower rocks on the other side of the fault plane. As a result of this blow the earthquake is produced.

In the past decade, the development of a bold new geological theory seems finally to have clarified the cause of earthquakes

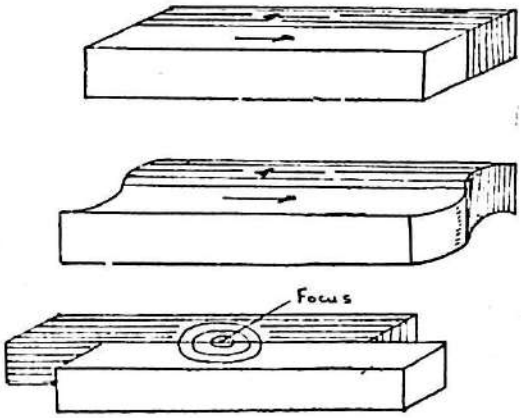

Fig II Plate tectonic

Called plate tectonics, the theory holds that the surface of the eatth consists of about a dozen 112-km-thick rock plates. These plates are floating on the earth's semi-molten mantle and propelled by unknown forces. Where they meet, friction sometimes temporarily locks them in place, causing stresses to build up near their edges. Then the rock fractures, allowing the plates to resume their motion. The sudded release of this pent-up energy cause the earthquake. (For example ; in California, two such great plates are sliding past each other along the San Andreas Fault). But earthquakes can also occur well within a plate, possibly because the plate structure has been weak-

ened in those places during periods of ancient volcanism.

There must be an instrument which can be able to record the earthquake waves. This instrument is known as Seismograph. Water can be said to be the primitive seismograph. From the wave direction of water the direction of earthquake wave was determined. Then came the mercury with grooves connected to tubes, from which earthquake would overthrow mercury through the grooves into the tubes and from an observation of this the direction would be determined. In 132 A. D., Chang Heng of China devised a method to record the earthquakes. It consist of a figure of a frog at the centre of a vessel which is again surrounded by eight figures of dragons sitting on spring and each holding a ball in its mouth. During earthquake the nearest dragon throws its ball to the mouth of the frog and thus the direction of the earthquake wave can be determined. After this devise there came pendulums seismographs. It consists of a horizontal pendulum which records the earthquakes by means of a beam of light thrown on a piece of photographic paper by the reflecting mirror attached to the pendulum. The time is measured by dots at the end of each munite.

There are two types of instrument for recording the intensity of the earthquake waves. One is Seismometer, which records local shocks only. The other type, records distant earthquake intensity, is called Seismograph. The main factors in the function of a seismograph are consisting of a rotating drum which is attached firmly to the ground and shakes during the passage of earthquake waves. The inertia of a heavy weight tends to keep it from moving, and thus a pointer attached to it tends to remain steady. A wavy line is recorded on the slowly

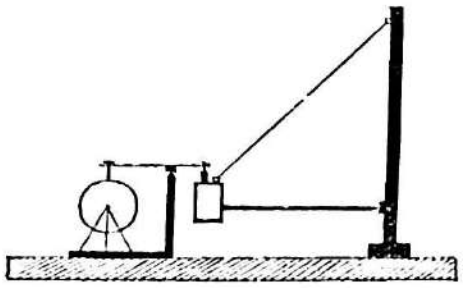

Fig III A model of Seismograph

rotating, vibrating drum. Most seismographs today are kept in darkened rooms. A photographic paper is wound around the drum and a light source is substituted for a pointer. The record left on the paper is called seismogram. The seismograph is usually connected with a clock so that intensity record is correlated with time record.

The seismic shocks, felt by earth's surface may vary widely in their magnitude. While some are very feeble and some are severe. Some may not cause any destruction and on the other hand some may cause severe destruction. So in order to compare the intensities of different earthquake readily we need a scale to measure the intensities. The intensity of an earthquake is defined as the magnitude of vibration, set up on the earth's surface, due to the seismic shock. Based on this an Italian seismologist Rossi and a Geneva professor Forel proposed a scale for the measurment of intensities. It has got ten divisions as shown on the table.

Intensity	Name of the shock	Effects
I	Microseismic	Recorded by delicate instruments only.
II	Extremely Feeble	Recorded by all seismographs. Felt by experienced persons only.
III	Very Feeble	Felt by several persons at rest.
IV	Feeble	Felt by persons in motion. Affects windows and ceilings of houses.
V	Moderate	Felt by every one. Greater disturbances on houses and produces ringing of bells.
VI	Fairly strong	General awakening of persons from sleep and ringing of bells, Clocks stop. Trees oscillate.
VII	Strong	Overthrows movable objects. Causes removal of plasters but no general damage to building. Church bell rings.
VIII	Very strong	Fall of chimneys and cracks in the walls of buildings.
IX	Extremely strong	Partial or complete destruction of buildings.
X	Shock of Extreme Intensity	General destruction of buildings and ground. Produces landslides in mountainous regions.

Next, an Italian seismologist, Mercalli, has given another scale. It has got twelve divisions. The table is given below.

Intensity	Acceleration produced	Name of the Shock	Effects
I	Less than 1 Cm/Sec/Sec	Instrumental	Recorded by seismographs only.
II	Over 1Cm/Sec/Sec	Very Feeble	Perceived only by sensitive persons.
III	Over 2·5Cm/Sec/Sec	Feeble	Perceived by persons at rest.
IV	Over 5Cm/Sec/Sec	Moderate	Perceived by persons in motions.
V	Over 10Cm/Sec/Sec	Fairly strong	Wakes persons. Rings bells.
VI	Over 25Cm/Sec/Sec	Strong	Produces cracks in the walls.
VII	Over 50Cm/Sec/Sec	Very Strong	Slight damage to buildings.
VIII	Over 100Cm/Sec/Sec	Destructive	Throws chimneys.
IX	Over 250Cm/Sec/Sec	Ruinous	Overthrows buildings.
X	Over 500Cm/Sec/Sec	Disastrous	General destruction of buildings.
XI	Over 750Cm/Sec/Sec	Extremely Disastrous	Few buildings are left standing Causes fissures in the ground.
XII	Over 980Cm/Sec/Sec	Catastrophic	Total destruction of buildings and ground, Objects throws up.

In Japan, F. Omori studied the earthquake waves thorougly and established that the intensity of any seismic shock is proportional to the acceleration imparted to a body set in motion by the incident waves. Based on this criteria Omori put forward a scale of intensity of earthquakes in which the shocks of different intensities were defined and classified in terms of the amount of acceleration generated by the waves. The scale introduced by Omori is more scientific and rational than those described previously. In recent years a magnitude scale has also been proposed, which is supposed to offer an overall picture of the total amount of energy actually released during any earthquake.

Earthquake affecting a vast area do not cause the same destruction everywhere. So with the help of any suitable scale of intensity an earthquake affected area can be divided into many zones. The line of separation of these zones are called isoseismals. These

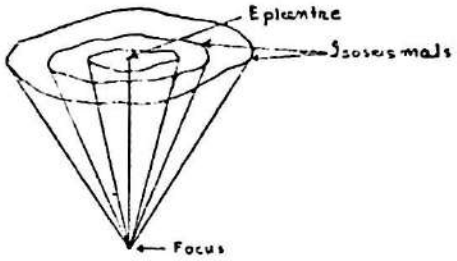

Fig IV

isoseismals generally occur in the form of closed, more or less concentric curves. The source from which the earthquake is generated below the earth's crust is called focus. The point lying vertically above the focus is known as epicentre. It is well known that intensity of earthquake is more at the focus and is reduced gradually in all directions. Now we have come to know that epicentre is the nearest zone from the focus on the surface of the earth, and therefore earthquake's affect will be greatest in epicentral zone. But one thing is to be noted that the earthquake can not originate at a mere point alone. Disturbance occur over an area and that area is called focus and therefore epicentre also must be an area, not a point. Earthquake originating at a depth of 30 miles or less, below the earth's surface, are commonly described as shallow focus earthquakes. If the focus is situated at a depth of 50 miles to 450 miles, below the earth's surface then it is called a deep focus earthquake.

The energy, released from the focus, is transmitted in all directions in the form of earthquake waves. These waves are of three types. They are (1) Primary wave (2) Secondary wave & (3) Surface wave. Now we are to see that what are the nature of these waves. The Primary wave is also know as Push wave or, Longitudinal wave or; compressional wave or P-wave, Primary waves are similar in character to that of Sound waves. The movement of Primary wave is to and fro in the lines

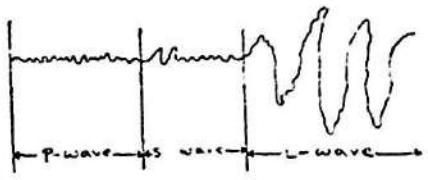

Fig V :-
Waves recorded in Seismogram

of propagation. They are the fastest in velocity and cause preliminary tremors on the surface. These waves can pass through both solid and liquid medium but Secondary wave can not pass through liquid. Light waves and

secondary waves are similar in character, that is, they are transverse in nature. The movement is at right angle to the lines of propagation. Their velocity is much less than that of P-wave. The secondary wave cause shaking at the surface and therefore they are also called shake-waves or, S-waves. Both P-waves and S-waves have a tendency to move inward to the core of the earth. They also obay the optical laws of reflection and refraction. So during their propagation they use to propagate in a curve line, not in a straight line. This reveals that the earth is not homogineous. During their propagation, S-wave set into severe vibration and as a result some minute waves are generated up on it. They are known as Surface-waves. These are also transverse in nature but sometimes have rotary effect. They travel much slower than P-waves and S-waves. Surface-waves or L-waves follow a circumferential path on the surface of the earth. The amplitude of vibration in L-waves are very small, but their destructive power is very great. If the amplitude of L-waves increase beyond only $\frac{1}{16}$th of an inch, the earthquake will be one of the most disastrous one. Along with the general P-waves and S-waves there are other two types also. They differ from the ordinary P-waves and S-waves only in velocity. Among them Pg and Sg are slowest in velocity and P* & S* are intermediate in velocity. So we have seen that though P-waves and S-waves are generated first they are not the main cause of destruction, but L-waves which is produced by P and S waves, is the main cause of destruction.

Earthquake waves are important in geology because, in a sense, they x-ray the Eearth. We live on the surface of the earth's crust. What lies beneath the crust ? Answer to this question comes from the study of seismic waves. Based on such studies, the Earth is found to have three prominent concentric zones. They are, from surface down to centre. (i) Crust (ii) Mantle & (iii) Core.

Determining the velocities of the waves in different layers of the earth's crust, the crust is found to be 50 km. in thickness. The thickness of the mantle is found to be 2,900 km. and core is 3,428 km. The crust is subdivided in to two layers, of which the upper layer is known as 'Sial' and lower one is known as 'Sima'. The Sial is about 16 km. thick and Sima is 34 km. The upper layer is rich in silicon and alumina. Here the avarage silica contant is 65 to 75 per cent. The silica percentage of the simatic layer is 50 to 60 percent, and aluminium is largely replaced by magnesium with small quantities of iron.

Between the crust and the mantle is a transition boundary known as the Mohorovicic discontinuity named after its discoverer, the Yugoslavian geophysicist (in 1909).

The mantle portion is having similar composition as basalt, which is slightly richer in magnesia and it appears to be in the state of viscous mass.

The composition of the core is believed to be consist of iron with minor quantities of nickel and cobalt, The core is divided in to two subzones. The outer zone, with thickness of 2,176 km, is believed to be not in a solid state. The inner core behaves as a solid mass. The thickness of this zone is 1,252 km.

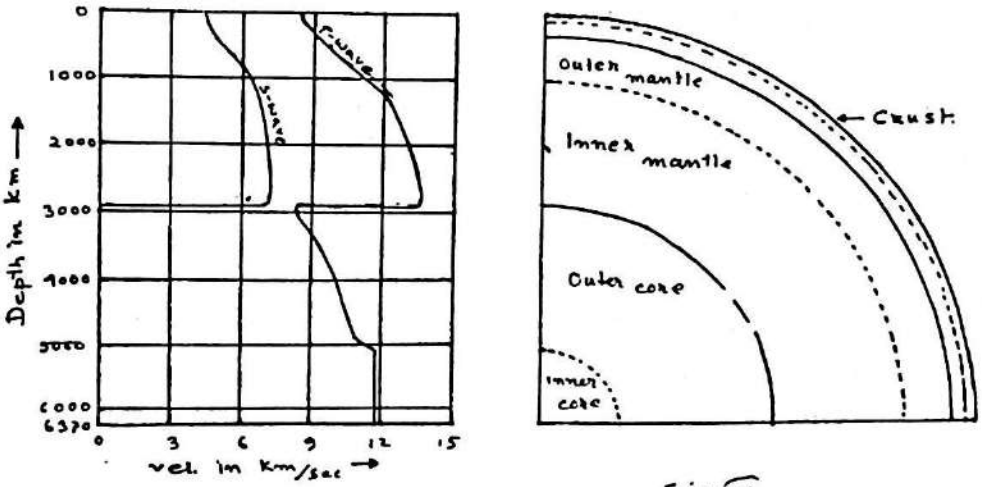

Fig VI

P and S waves are important in studying the structure of the Earth. Their velocities vary with the nature of the media, The time taken by P and S waves in passing through different media, or getting reflected or deflected from certain layers, are recorded by means of seismographs, From the study of these datas it is possible to ascertain the broad structural pattern of the Earth. L-waves are useful in studying the different layers in the crust.

In the crust, P and S waves travel at a velocity of 6 to 7 km per second. The velocity increases suddenly to 8 km per second, when it reach the surface of the mantle and then they travel with a fairly constant velocity up to the core. The velocity rises again in the core zone. S-waves are deflected at a depth of 2,900 km giving the evidence of the liquid medium at that depth, but P-waves still continue up to the inner most core of the Earth. Like this we can get a rough idea about the structural pattern of the Earth with the help of earthquake waves.

Earthquakes in Assam.

First written account about the earthquake in Assam is found in the "Tungkhungia Buranjee", which dates back to 1696 A. D. A chronological table of earthquakes in Assam, from 1869 to 1950, has been arranged by Mr. M. C. Podder. The table is given below.

TABLE

Sl. No.	Date of occurence	Probable epicentre	Remarks
1.	10-1-1869	Cacher (North eastern side of the Shillong plateau)	This was felt over an area of 250,000 sq. miles.
2.	12-6-1897	Shillong plateau	R.D. Oldham described this earthquake as the severest during the historic time. This was felt over an area of 1,750,000 sq. miles.
3.	8-7-1918	Srimangal	This was felt over an area of 80,000 sq.miles.
4.	9-9-1923	Lat, 25°8′ N and Long. 91°5′E (S-W Assam)	The shock was felt over Assam, Bengal, East Bihar and East Chota Nagpur.

5.	3-7-1930	Lat, 25°8′ N and Long, 90°2′ E	The shock was felt over an area of 350,000 sq. miles.
6.	14-8.1932	Lat, 25°8′ N and Long, 95°7′ E	The shock was felt over Assam, Bengal and North Bihar.
7.	21-1-1941	Lat, 27°5′ N and Long, 92°5′ E	The shock was felt near Assam and north and east of Bengal.
8.	23-10-1943	Lat, 27°5′ N and Long, 93°5′ E	The shock was felt over Assam, Bengal, Bihar and north east Orissa.
9.	29-7-1947	Lat, 28°5′ N and Long, 94° E, (100 miles N.W. of Dibrugarh)	The shock was felt over Assam, in Bengal up to Calcutta and in Bihar upto Purnea.
10.	15-8-1950	Rima	One of the five biggest eartequake of the world.

After a close study of the earthquakes of different periods in Assam, it is reasonably inferred that Assam is one of the most unstable regions of India, The fault zone, which is the cause of earthquake, of the Himalayas and Shillong plateau are comparatively more unstable than the rest of Assam.

Earthquake Forecasting :

The forecast of earthquake can be of immense value in minimising the disastrous effects up on mankind. Earthquake generally occur all of a sudden and without warning. Some times preliminary tremors or rumbling sounds are perceptible.

As already we know that the earthquake is the cause of sudden relief of strain by displacement of the strata, therefore when strain is accumulating, some effects like slight tilting of ground or rock slides are often seen.

In early 1910, geologist Harry Reid suggested the construction of number of piers at some distances perpendicular to the direction of a fault and a regular study of them might give the idea of accumulating strain which would cause an earthquake.

Dr. Davison suggested the recoiding of shocks and the increase in seismic activity along known fault zone.

A careful study of rain and snow fall was suggested by Prof. H. C. Das Gupta for the prediction of an earthquake. In humid countries rain water and snow are the main transporting agent. Due to transfer of material from one place to another, great stresses are set up, according to the idea of isostatic adjustment. So there is a possibility of existence of a relationship between the rain and snow fall, and earthquake. Japanese seismologist Prof. Omori has shown that there is a relation between the rain and snow fall, and earthquake Frequency.

Seismologist Malcolm Johnston had analysed data from seven monitoring stations set up along the San Andreas Fault, 130 to 190 km. south-east of San Francisco. From his data, he observed that the strength of the local magnetic field had suddenly risen between two of the stations, and gradually subsided over a period of one week. After few day there was an earthquake.

The forecast was a dramatic demonstration that scientist are on the verge of being able to

predict the time, place and even size of the earthquake.

In 1949, a devastating quake struck the garm region in the USSR. After this, the Soviet seismologist became alert and began to study the quake-prone area to discover any geological early-warning signals.

In 1971, Soviet Scientists announced that they had reached their goal. The most important signal, they said, was a change in the velocity of seismic-wave vibrations passing through the earth's crust. Primary waves compress and expand the rocks during their propagation along their direction of propagation. Secondary waves move the rock in a direction that is perpendicular to their path.

Because the P-waves travel faster than S-waves, they reach seismograph first. Soviet seismologists found that the difference in arrival times of P and S-waves began to decrease markedly for days, weeks, even months before a quake. Then this difference mysteriously returned to normal, shortly before the quake struck. If the period of abnormal velocity is longer, then the tremor will be also larger.

An explaination for this variation was already available. In the year 1960, an American team of researchers under Massachusetts Institute of Technology geologist Willam Brace had discovered that, as rock approaches its breaking point, numerous tiny cracks form in certain directions. This phenomenon, called dilatancy, cause the seismic waves to slow down as they pass through the rock.

Once again much interest was given on dilatancy after the Russian discoveries. When cracks first open in the crustal rock, its strength increases, and rock temporarily resists fracturing. In this case seismic waves slow down because they do not travel fast in rock with cracks, as they would travel through solid rock. Then groundwater begins to seep into the openings in the dilated rocks and thus seismic-wave velocity quickly returns to normal. The water also weakens the rock until it suddenly gives way, causing the earthquake. Since the cracking of the rock increases its volume, therefore dilatancy can give rise to crustal tilting and uplifting, causing some quake.

In forecasting the earthquake, a major success has now been reported from China. Many earthquakes are accurately predicted in the past few years. Including the above methods, the Chinese scientists also pay close attention to exotic pre-quake signals including the animal behaviour, so far largely overlooked by other nations. We can site an example for these pre-quake signals. In the mid December 1974, unusual behaviour among animals was reported in one area, water wells got suddenly muddy and bubbling, and water levels rose or fell frequently. There was an increase in the radon content of ground water. The radon contents in several wells were being checked once or twice daily, since increases in radon content had been found to precede at least six earlier earthquake. The changes had appeared several days before the tremor. (The radon variations are normally predicted directly by measuring the changes in alpha-

particles emitted by the radon. An indirect method has been recently suggested. It is to measure the atmospheric electricity, mainly atmspheric electric field and conductivity which will be affected by any large infusion of radon into the atmosphere from the ground water.) Following these events closely came an quake of magnitude 4·8.

In our country, in this side (i.e. earthquake forecasting) much interest is not yet given. This is an important step which is to be given by our geologists.* • • •

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* The above article has been prepared, taking help from the following books.—Bibliography

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Radhanath Phukan : A CRITIQUE OF HIS IDEALISTIC VIEW OF MODERN SCIENCE

Prof. Sibanath Barman
Dept. of Physics

It is well-known that late Radhanath Phukan whose birth completed a century last year was an idealist in philosophy,—a vedantist who made a vigorous attempt to "delete" matter from the physical world and equate modern physics with the vedanta, the great idealistic system of Indian philosophy. In his preface to "Samkhya Darshan" he wrote "The new Science of to-day has proved experimentally that there is nothing called matter in this world. There, are only two substances—(1) conciousness and (2) energy. .....Science also says that energy has no real existence. It is only our imagination and a creation of mathematics." (translated from Assamese). Again, "Tearing off the atoms of the world, science has pointed out to us that there is no matter, only electrical energy ; but it is also the product of mathematics arising out of our minds—only a case of imagination" (Vedanta Darshan, p. 4. translated from Assamese).

In his preface to the "Samkhya-karika of Iswarkrishna" (which he edited), he made following frank comment "But now the western science is no longer materialistic but it is idealistic".

Innumerable such statements can be quoted from his books.

In his views on science, late R. N. Phukan was an ardent follower of Jeans and Eddington, the two well-known British physicists of the early 20th century. But their idealistic interpretation of science has long been outmoded in the western philosophical milien. Miss L. Stebbing in her book "Philosophy and the physicists" clearly points out all the logical inconsistences of Eddington and remarks that "modern theories

of the atom afford not the slightest justification for saying that the recent developments in physics have any tendency to show that materialism is false or are capable of being used to provide any argument in favour idealism." M. cornforth in his "Science Verses Idealism" writes, "Analytical philosophers have pointed out that the writings of Jeans and Eddington are extremely muddled and lacking in clear logical analyasis. This is very true."

But the uncritical eulogies lavished on late Phukan and the lack of dispassionate objective assesment of his works point to the fact that Assamese intelligentsia is not yet very much aware of this change of philosophical climate in the west. Still under the impression that modern physics has reduced matter to thought, they readily fall in line with Phukan's argument that modern physics is gradually gravitating towards the philosophy of the Vedanta.

The effort to equate modern physics with the Vedanta, however, is not Phukan's ingenuity; it was the effort of the whole nationalist bourgeoisie of the pre-independence era. To give concrete examples :— In Radhakishnan's "Idealist View of life"; there is a long chapter entitled "Matter, Life. Mind" where in he quotes profusely from Jeans and Eddington and concludes that in the modern age "Matter is reduced to thought physics to Mathematics". Radhakrishnan's disciple P.T. Raju writes in his "Idealistic thought of India", "We are driven to conclude that science may start from being, but later it leaves to itself and ends in the formulation of a hypothetical reality that has nothing to do with existence."

Viewed from historical perspective; there were some justification in holding such opinions in the olden days, because these were inter alia philosophical attempts to arouse the Indian masses from the slumber of British slavery. But in the modern India of to-day, such hang-overs have evidently turned into their opposites and become a big hurdle in the making of a rationally constructed socialist society.

* * *

Science as we all know always presupposes a common and material world. Indeed the whole edifice of science is built upon it. The basis of science is not some idle arm-chair reveries of the idealist, but concrete, emprical observation, logic and experimentation. It does not try in the manner of the idealist to explain the material world from some havenly premise, but the havenly world from the material premise. For physics in particular, which is intimately concerned with the nature of the material world we live in, the existence of matter is its raison detre; for if there is no matter, there will be no physics even to prove its non-existence! With the disappearance of matter, the brain, the mind, the ideas of the physicsts,— all would have disappeared !! Of course, we do sometimes find certain conclusions of science to be contradictory to the common-sense picture of the world, but this is not because science is idealistic; but because science wants to give us a most adequate account of our many different perceptions by fitting them together into a rationally consistent whole; not necessarily in keeping with the common-sense picture of the world.

A close scrutiny of the material premise which leads the idealists like R. N. Phukan to proclaim the "death" of matter reveals their big gap between theory and practice. Philosophy, unlike what the scholastic philosophers presume is a social product, not a supra-mundone creation. It is not endowed upon the human brain from "above", but is born in the society of man ; society determines it and its nature changes as the society changes. In class societies, where one class lives an the labour of another, the growth of idealism is a natural sequence. All the necessaries of life being aupplied by the working class, the upper classes forget the classic dictum of Feurbach that in order to philosophise, man must eat and that in order to get food, he must work. The mischievous seperation of thought from practice makes the physical world for them an illusion and the illusory world a physical reality. Uprooted from the solid material basis, their conciousness can no longer conceive the physical world as a physical reality ; it simply flatters itself that "it really represents something without representing something real (Marx); the idealism of Radhanath Phukan and his company grows out, if not only, but primarily of their class position in society.

Class position apart, the question as to why the philosophical gurus of Radhanath Phukan i.e. Jeans Eddington—tend to become idealists can be answered if we bear in mind the period in which this tendency developed i.e. The first decades of the twentith century. This was a revolutionary period in physics. During this period, many of the traditional conceptual pillars like mass, energy, space, time, gravitation etc. That constituted Newtonian Physics broke and new concepts arose in their place. At the begining of this century, these changes appeared so sudden and novel that the philosophical minded physicist like Jeans and Eddington, unaware of dialectical thinking, were rather compelled to jump to the conclusion that matter "disappeared" from the physical world, forgetting that this disappearance actually means "change". Their minds were unconsciously pinned on the mechanical concepts of nature of the bygone days ; and so, when with the advent of the theory of Relativity and Quantum theory, the old concepts about matter vanished, they thought that matter itself vanished. Ignorant of the dialectics of nature and the great principle that "nothing is immutable but abstract movement" they, to use a phrase of Lenin, had to "throw the baby along with the bath-water". They didnot know that "matter disappears" means the limit within which we have here to known matter disappears and our knowledge is penetrating deeper ; the properties of matter are likewise disappearing which formerly seemed absolute, immutable and primary.....and which are now revealed to be relative and characteristic only a certain states of matter" (Materialism and Emperio criticism).

Science is not, nor can be ever, a closed book of nature ; it is a never ending search of mankind to fathom, the unfathomable mysteries of the material world. The crises that occur in the concepts of matter from time to time donot indicate the "death" of matter, but to indicate the growing depth of man's knowledge about it.

Begining from the time of Galileo upto the end of the nineteenth century, physicists

had been trying to explain the physical world in a mechanistic way. They assumed the world to be a big machine. They thought that just as an expert mechanic can get the complete knowledge of a machine by observing its different parts, so we too, had we been provided with very precise data and powerful mathematical tools, can get a complete knowledge of the physical world without in any way affecting it. The classical physicists drew up a very sharp line of demorcation between the observer and the world observed.

But after the discovery of the modern theories of space time and matter, this traditional conceptional structure cracked. The new theories invariably showed that man and nature (i.e. the observer and the world observed) are not entirely independent entities. They interact dialectically, each changing the other in the process, and that is the reason why nature cannot be observed in a detached way as if from a distance. "Our experiences", writes Brownowsky "donot merely link up with the outside world ; they are us and they are the world for us ; they make us part of the world. We get a false picture of the world if we regard it as a set of events and have their own absolute sequence and we merely watch... If we write the laws of nature, and we ourselves had no part in them, we get the wrong answer to quite elementary questions, for example, about the orbit of the planet Mercury (as Einstein showed) from supposing, that nature is an imperturbable machine at which we peep from outside. That is a false picture of physics and philosophy. Nature is a net work of happenings that donot unroll like a red carpet into time, but are intertwined between every part of the world and we are among these parts".

This is a philosophy quite foreign to Jeans and Eddington and other philosophical minded phisicists of the said period. Their a priori assumption that men and nature are basically antithetical in character deterred them from understanding the true philosophical significance arising out of the modern theories of matter, and thus they fell a prey of idealism. Radhanath Phukan, as a follower of Jeans and Eddington shared the same fate, which impelled him to make frank but dangerously wrong comments on the nature of modern science.

• • •

"Natural science developed in the midst of the general revolution and was itself throughly revolutionary".

[POEM]

'So our minds never feel bore'

Mukul Kumar Talukdar
P. U. 1st yr. (Sc)

To-day's present is tomorrow's past
all though the time is flowing as fast
Tomorrow's future has charms with mere
So our minds never feel bore.

To-day's young is tomorrow's old
As the time certainly never halt
Thus our solves are running with source
So our minds never feel bore.

The future cheats us always far
The past presents us anxiety and horror
But the present period is suitable more
So our minds never feel bore.

EXPLORING THE MIRACLES OF THE MIND

Amitava Maitra
B. Sc. (2nd yr.)

Most misterously, a human's system is guided and run by an $3\frac{1}{2}$ pound pinkish grey material known as the human brain. It is located inside the skull. It is the seat of human thoughts and conciousness, the source of the ingenuity that had helped our ancestors to survive in this world in the midst of the inormous; mighty animals that had existed on the surface of the earth in course of time. Everything that man is and would be right from the days of our 'tools' has become possible only due to this brain.

From centuries scientists have been trying to explore the mechanism of the brain which led man to secure a unique position in this world among the living beings. Through their explorations, the scientists taught differently but uneffectively and as a result all their teachings have been left unaccepted.

It is only at present that man is partly successful in exploring his own brain. He has achieved success after a great voyage of discovery. In dozens of laboratories, the psychologists, biologists, physicists and chemists realized that what goes on inside the brain could be indged from ones behaviour outside. Man has split the atom, cracked the genetic core and fassinating our ancesstors outlook has slepped on the moon.

The exploration of the interior of the brain has brought to an effect in describing that the brain lies within the cranial cavity of the skull. It develops from a single tube which initially stros three enlargements, the fore-runner of the brain, termed, fore-brain, mid-brain and hind-brain.

The fore-brain enlargement develops rapidly and enormously in comparison with other parts of the body, so that when a developing embryo is seen it appears to be almost all head. Two large wellings, one on either side of the fore-brain, develop to become the right and the left cerebral hymespheres, together called cerebrum. Thickenings in the floor of these cerebral hemisphere become the corpns striatum. The remainder of the fore-brain enlargement develops a thickening in each lateral wall which becomes the thalamns.

The mid-brain enlargement develops into the mid-brain, the first part of the brain stem, which links the cerebrum with the spinal cord.

The hind-brain enlargement develops to form the pons varolii, the medulla oblongata and the cerebellum. Shows :

The Fore-Brain, becomes the cerebral hemispheres,
Corpns stratinm and the thalami.
The mid-Brain, the mid-brain.
The Hind-Brain, the pons Varolii, medulla Oblongata and the cerebellum.
These three form the Brain Stem.

This division of the brain has been accomplished by the medical science.

Though man himself has oncceded partly in exploring his own brain ; he is yet for to explore the mystry of memory, sensation, learning and conciousness,

A world wide interest and resarch led to the discovery of the structure of the D.N.A. molecules by Francis Cricks and James waston in 1953 which inspired the scientists a lot to accept a challenge regarding the brain. The newroscientists led some evidences which helped to introduce modified treatments for the cure of some disorders like schizophrenia, depression, Parkinsons disease epilepsy and to apply new techniques for relieving pain and controlling some sorts of violence. Even this accomplishment is far from satisfying thirst of exploring the memory and conciousness that has placed man in a unique position among the living beings of the world. A key to this mystery could led to better methods of treatment. It could result in identification and connection of the causes of many neurogical disorders and by revealing how the brain works, revolutionise thoughts, education and communication. It might help man f.om self-destruction. Professor Francis Schmitt oays : "If man could discover why he is unique, he might not destroy himself. He might respect himself more than he does."

A general man could not undevestimate in reaching to the conclusion that the brain is an organ of enormous complexity. Elbert Hubbert says ; "One mechine can do the work of fifty ordinary man, no mechine can do the work of an extraordinary man." The brain is an extraordinary one, but one using it ordinarily cannot realize its significance C.L. Lewis says : "No matter how sophisticated and powerful our thinking mechine become there still will be two kinds people : those who led the mechine to do their thinking for them, and those who tell the mechine what to think about it. "The computer is after all a mechine capable of doing what its human builders teils it to do.

The brain unlike the computer, can repair itself an area can learn the functions of another in some cases of brain damage and unlike the computor which would be turned off at the flip of a switch, the brain remains constantly active whether waking or sleeping. Behind these functions—a brain is a saint to propagate its version among its deciples to guide them and direct them differently in the proper channel to go for.

Indeed, man has, to some extent, at last succeded in elucidating the interior of the brain. But to him, his fantasy, memory, learning and conciousness has yet remained a mystry. This mystry once being solved would help man to master his own brain. It might help man to get rid of excitements and emotional feeling which brings an evil effect in the brain. Getting the better of it might help man to respect himself more. • • •

Annual College Week 1975-76
Results of the fine Arts Competition

The following students were awarded prizes for participation in the **fine arts Exhibition.**

Pencil Drawing :

1. Dwijendra Choudhury, 2nd year P.U.
2. Nripendra Kalita, 1st year P.U.
3. Mrinali Choudhury, 2nd year P.U.

Oil Painting :

1. Nil
2. Debajit Hazarika, 2nd year P.U.
3. Bikash Arandhara, 1st year P.U.

Water Colour :

1. Chandra Mallika Choudhury, 2nd year P.U.
2. Nripendra Kalita, 1st year P.U.
3. Pritam Hazarika, 2nd year B.Sc.

Black and White :

1. Parikshit Barman, 1st year B.Sc.
2. Paritosh Deb, 2nd year P.U.
3. Sivajul Hussain, 1st year B.Sc.
   Kaushik Patakh, 2nd year P.U.

Sketch :

1. Nil
2. Sujit Bhattacharjee, 1st year B.Sc.
3. Badal Karmakar, 2nd year P.U.

Sculpture and Carving :

1. Bijoy Hazarika, 2nd year B.Sc.
2. Neelim Sovam Goswami, 2nd year P.U.
3. Kamalesh Deka, 2nd year P.U.

Photography :

1. Dwijendra Choudhury, 2nd year P.U.
2. Kamalesh Deka, 2nd year P.U.
3. Paritosh Deb, 2nd year P.U.

Stamp Collection :

1. Bikash Arandhara, 1st year P.U.
2. Pranjal Choudhury, 1st year P.U.
3. Nil

Flower arrangement :

1. Nil
2. Vaswati Sengupta, 2nd year P.U.
3. Gakul Bhagabati, 2nd year P.U.

Doll making :

1. Mandhiv Kaur, 2nd year P.U.
2. Vaswati Sengupta, 2nd year P.U.
3. Deepali Kalita, 1st year B.A.

Embroidery :

1. Meera Medhi, 1st year B.A.
2. Geeta Deka, 1st year P.U.
3. Subhra Das, 2nd year P.U.

Consolation : Manju Devi, 2nd year P.U.

Wollen works :

1. Gurjit Kaur, 2nd year P.U.
2. Bijoya Dey, 2nd year P.U.
3. Trilocahan Kaur, 2nd year P.U.

Rose Collections :

1. Bikash Arandhara, 1st year P.U.
2. Vaswati Sengupta, 2nd year P.U.

Crochet works :

1. Nil
2. Kaushalya Thakuria, 1st year P.U.
3. Papari Talukdar, 1st year P.U.

Weaving :

1. Rumita Baruah, 1st year P.U.
2. Raju Deka, 2nd year P.U.
3. Manju Chaudhury, 2nd year P.U.

Meet together Embroidery :

1. Manashi Khound, 2nd year B.Sc.
2. Deepali Kalita, 1st year B.A.
   Papari Talukdar, 1st year P.U.
3. Manisha Ghosh, 1st year P.U.

Meet together Sketch :

1. Nripendra Kalita, 1st year P.U.
2. Parikshit Barman, 1st year B.Sc.
3. Mrinalee Chaudhury. 2nd year P.U.
   Badal Karmakar, 1st year P.U.

Best Organiser : Ashok Sarmah, 1st year P.U.

Best Social Worker : Monoj Borgohain, 1st year P.U.

General Sports Section

Boys' 5.000 m, Race :

1. Shri Biren Ch. Huzuri, P.U. 2nd year Arts.
2. ,, Suresh Dewri, P.U. 2nd year Arts.
3. Md. Samsul Alam Laskar, P.U. 2ndyear Sc.
4. Shri Chamak Roy Kalita, P.U. 1st year Sc.
5. ,, Ajit Kalita and others—

800 m, Race :

1. Md. Azad Ahmed, P.U. 2nd year Arts.
2. Shri Suresh Dewri, P.U. 2nd year Arts.
3. Md. Mazum Ali, P.U.

400 m, Race :

1. Shri Suresh Dewri, P.U. 2nd year Arts.
2. ,, Debazit Mazumdar, P.U.
3. Md. Azad Ahmed, P.U. 2nd year Arts.

200 m, Race :

1. Shri Santanu Biswas, P.U. 2nd year Arts.
2. ,, Suresh Dewri, P.U. 2nd year Arts.
3. ,, Debazit Mazumdar, P.U.

100 m. Race :

1. Shri Santanu Biswas, P.U. 2nd year Sc.
2. ,, Ramani Baruah, B.Sc. 2nd year
   ,, Mohini Baruah, P.U. 2nd year Sc.
3. Md. Azad Ahmed, P.U. 2nd year Arts
   Shri Suresh Dewri, P.U. 2nd year Arts

4×100 m, Relay Race :

1st Group—

1. Shri Santanu Biswas, P.U. 2nd year Sc.
   ,, Ramani Baruah, B.Sc. 2nd year
   ,, Mohini Baruah, P.U. 2nd year Sc.
   ,, Suresh Dewari, P.U. 2nd year Arts

2nd Group—

1. Shri Ranjit Medhi. B.Sc. 2nd year
   ,, Preetam Hazarika, B.Sc. 2nd year

,, Utpal Das, B.Sc. 1st year
,, Subhendra Das, B.Sc. 2nd year

3rd Group—

1. Md. Abdul Requim
   Md. Sirzul Hussain
   Shri Pulin phul Konwar
   ,, Mrinal Dutta

Hammer Throw :

1. Shri Tapan Gogoi, P.U. 2nd year Sc.
2. ,, Tarun Sarkar, P.U. 2nd year Sc.
3. ,, Ramani Baruah, B.Sc. 2nd year Sc.

Shot-put :

1. Shri Tapan Gogoi, P.U. 2nd year Sc,
2. ,, Ramani Baruah, B.Sc. 2nd year
3. ,, Tarun Sarkar, P.U. 2nd year Sc,

Discuss Throw :

1. Shri Tapan Gogoi, P.U. 2nd year Sc.
2. ,, Rajen Bhuyan, B.Sc. 2nd year
3. ,, Uddam Singh, P.U. 2nd year Arts

Javeline Throw :

1. Shri Ramen Hazarika, P.U. 2nd year Sc.
2. ,, Suresh Dewri, P.U. 2nd year Arts
3. ,, Uttom Das, P.U. 1st year Sc.

Running Broad Jump :

1. Shri Santanu Biswas, P.U. 2nd year Sc.
2. ,, Mohini Baruah, P.U. 2nd year Sc.
3. ,, Mitradev Talukdar

Boys' Hop-Steps, Jump :

1. Shri Santanu Biswas, P.U. 2nd year Sc.
2. ,, Tarun Sarkar, P.U. 2nd year Sc.
3. ,, Mohini Baruah, P.U. 2nd year Sc.

High Jump :

1. Shri Tapan Gogoi, P.U. 2nd year Sc.
2. ,, Mohini Baruah, P.U. 2nd year Sc.
3. ,, Alok Sarma, B.Sc. 2nd year
   Md. Naushad Ali

Pole-Volt :

1. Shri Ramen Hazarika, P.U. 2nd year Sc.
2. ,, Chamak Roy Kalita, P.U. 1st year Sc.
3. Md. Abdul Raquim

Womens' 400 m, Race :

1. Miss Minu Sarma, P.U. 1st year
2. ,, Illa Chowdhury, P.U. 1st year
3. ,, Raju Deka, P.U. 2nd year Arts

200 m, Race :

1. Miss Linoo Rajkhowa, P.U. 1st year Sc.
2. ,, Minu Sarma, P.U.
3. ,, Mandhir Kaur. P.U. 2nd year Arts

200 m, Race :

1. Miss Linoo Rajkhowa P.U. 1st year Sc.
2. ,, Rita Das, P.U. 2nd year Arts
3. ,, Urmila Chowdhury, P.U. 2nd year Arts

Long Jump :

1. Miss Linoo Rajkhowa, P.U. 1st year Sc.
2. ,, Mandhir Kour, P.U. 2nd year Arts
3. ,, Nandita Paul, P.U. 1st year Arts

High Jump :

1. Miss Linoo Rajkhowa, P.U. 1st year Sc.
2. ,, Mandhir Kour, P.U. 2nd year Arts
3. ,, Kanika Deka, P.U. 1st year

Discuss Throw :

1. Miss Krishna Chakraborty, P.U.
2. ,, Linoo Rajkhowa, P.U. 1st year Sc.
3. ,, Rita Das, P.U. 2nd year Arts

Javeline Throw :

1. Miss Linoo Rajkhowa, P.U. 1st year Sc
2. ,, Mrinali Chowdhury, P.U. 2nd yr. Arts
3. ,, Illa Chowdhury, P.U. 1st year

Shot-put :

1. Miss Mrinali Chowdhury P.U. 2nd yr. Arts
2. ,, Linoo Rajkhowa P.U. 1st year Sc.
3. ,, Chandra Mallika Chawdhury P.U. 2nd year Sc.

Girls' Musical Chairs :

1. Miss Mandhir Kaur P.U. 2nd year Arts
2. ,, Nandita Paul P.U. 1st year Arts
3. ,, Pranita Das P.U. 2nd year Arts

Go-As-you like :

1. Shri Suren Medhi (Pagal) P.U. 2nd yr. Sc.
2. ,, Santanu Moral (Na Bowri) P.U. 1st year Arts

Boys' Best Runner : Shri Suresh Dewari
,, ,, Thrower : Shri Tapan Gogoi
,, ,, Jumper : Shri Santanu Biswas
,, ,, Athelet : Shri Suresh Dewari

Girls' Best Athelet : Miss Linoo Rajkhowa

Best Organiser : Shri Preetam Hazarika

Best Worker : Shri Suresh Ch. Deka

Special Prizes to :

1. Prof : R. Talukdar
2. ,, : Dr. D. Ghosh
3. ,, : S. Barthakur

Boys' Common Room Section

Corram Singles :

Champion : Dilip Das
Runners up : Rabiul Hussain

Corram Doubles :

Champion : Rabiul Hussain and Dilip Das
Runners up : Chittaranjan Singh and Aloke Sarma

Table Tennis Singles :

Champion : Utpal Jyoti
Runners up : Bhaskar Mahanta

Table Tennis Doubles :

Champion : Utpal Jyoti and Rupak Sarma
Runners up : Bhaskar Mahanta and Arun Hazarika

Chess Champion :

Chittaranjan Singh and Bipul Chawdhury

Best Organiser :

Mr. Rabiul Hussain.

Girls' Common Room Section

Single :

Champion : Miss Rita Das P.U. 2nd year Arts
Runners up : Miss Geeta Deka P.U. 1st yr. Arts

Doubles :

Champion : Miss Miss Rita Das & her partner Miss Pranita Das
Runners up : Miss Leenu Rajkhowa & her partner Miss Dipali Choudhury

Mixed Doubles :

Champion : Mr. Rabial Hussain and his partner Miss Geeta Deka
Runners up : Mr. Chittaranjan Singh and his partner Miss Utpala Dey

Chinese Checker Competition :

Champion : Miss Utpala Dey
Runners up : ,, Sumita Roy

Table Tennis Competition :

Champion : Miss Papari Talukdar
Runners up : ,, Mamani Sarmah

Cooking Competition :

Miss Manju Chaudhury
,, Wahida Begam
,, Runumani Baruah

Best Organizer :

Mr. Kishor Sarma

Ex_Editors

Volume	Editor
I	Promod Patowary
II	Nabin Ch. Sarmah
III	Surendra Nath Kalita
IV	Hareshwar Bhatta
V	Janek Ch. Baishya
VI	Janek Ch. Baishya
VII	Khanindra Ranjan Das
VIII	Mohon Deka
IX	Parmesh Shil
X	Mahesh Kalita
XI	Bimaljyoti Choudhuri
XII	Satya Prashad Kalita
XIV	Jiten Lahkar
XV	Jiten Lahkar
XVI	Sachindra Ch. Sarmah

Vol. XIII has been not Collected

WE CONGRATULATE oooo

Dr. PHANIDHAR DEKA, obtained Ph.D. degree from G.U. in 1974 on the topic, "The spatial and Temporal stabilities of the Indian and the American Urban systems : A comparative study." He was the lecturer of Geography Deptt. of our college. Recently he has started for working at the National University of Somalia, East Africa.

Dr. PRABAL SENGUPTA, M.Sc., Ph.D. did his research work under the guidence of Dr. (Mrs) A. Choudhury M.Sc., Ph.D, Reader, Deptt. of Chemistry Gauhati University on the topics "Studies on the preperations and reactions of 2 nitro 4 methyl ozobenzene 2' sulphenyl bromide and its derivatives."

Dr. GANGESH CH. KAR, M.A., Dip (stat) Ph.D. Dr. Kar is the lecturer in the Department of Economics of A.V. College. He obtained Ph.D. degree from Gauhati University for his thesis "Problems of Agricultural Labourers in Assam Since Independence" which is a masterpiece in the field of study of this kind. He worked under the guidence of Dr. S. N. Mehrotra, Professor, Head and Dean of Faculty of commerce, Gauhati University.

Dr. DEBABRATA GHOSH, obtained Ph.D. degree in Biochemistry in 1973 from G.U.. on the topic of "Studies of the influence of hormones on calcium metabolism". He carried out research work under the guidence of Dr. Pratul Goswami, Professor of Biochemistry, Gauhati Medical College. He is the first non-medical in Assam who obtained Ph.D. in Biochemistry. So, far he has published fine research papers in different journals of India.

(Photo is not available)

Dr. Prabeen Sharmah,
M.Sc., Ph. D.

Dr. B. L. SRIVASTAVA, obtained Ph.D. degree on the topic, "The theme of impersonality in the thoughts of Keats" from Gauhati University.

Dr. RENUKA DAS, Received Ph.D. degree from Calcutta University in 1971 Title of the thesis is "A study on some morphological characters of human foot with special reference to their heridity and growth.

Dr. DEEPTI DAS, obtained Ph.D. degree on the topic "Tribal population and settlements in Kamrup with special reference to the concentrations in the Southern Region" from Utkal University.

Dr. CHATURBHUJ PATHAK, M.Sc. Ph.D. was awarded the Doctorate Degree in 1975 by the Gauhati University for his thesis on "A study on the Cretaceous Formation in and around Dowki, Meghalaya".

RADIANT STARS OF THE YEAR

Mr. SURESH DEURI,
Best Athelet of the year.

Miss LINOO RAJKHOWA,
Best Lady Athelet of the year.

Mr. SANTANU BISWAS, the winner of Silver medal in 100 m. race and Bronze medal in Hope-step jump in inter-college festival. He was also awarded Gold medal in short distance runner competition in last inter-state national meet.

Mr. BIREN CH. HUZURI, the winner of Silver medal in 5,000 m. race in inter-college festival.

Mr. Chittaranjan Singh,
Joint Chess Champion of college week.

Mr. AZAD AHMED,
Badminton Champion of Singles, Doubles, Mixed Doubles.

Mr. PRITAM HAZARIKA
Best organizer of College week.

Mr. AMLANDEEP DAS,
Best cricketer of inter class Cricket Competition.

Miss UTPALA DE,
Badminton Champion (Singles)

From L to R

Mr. RAMANI BORUAH, the winner of Gold medal (1974) Silver medal (1975) and Mr. P. ASANG AIER, the winner of Bronze medal (1974-1975) in weight lifting of Inter College Festival (1974-1975) respectively.

'Mr. ARYAN'

(Photo is not available)

From L to R

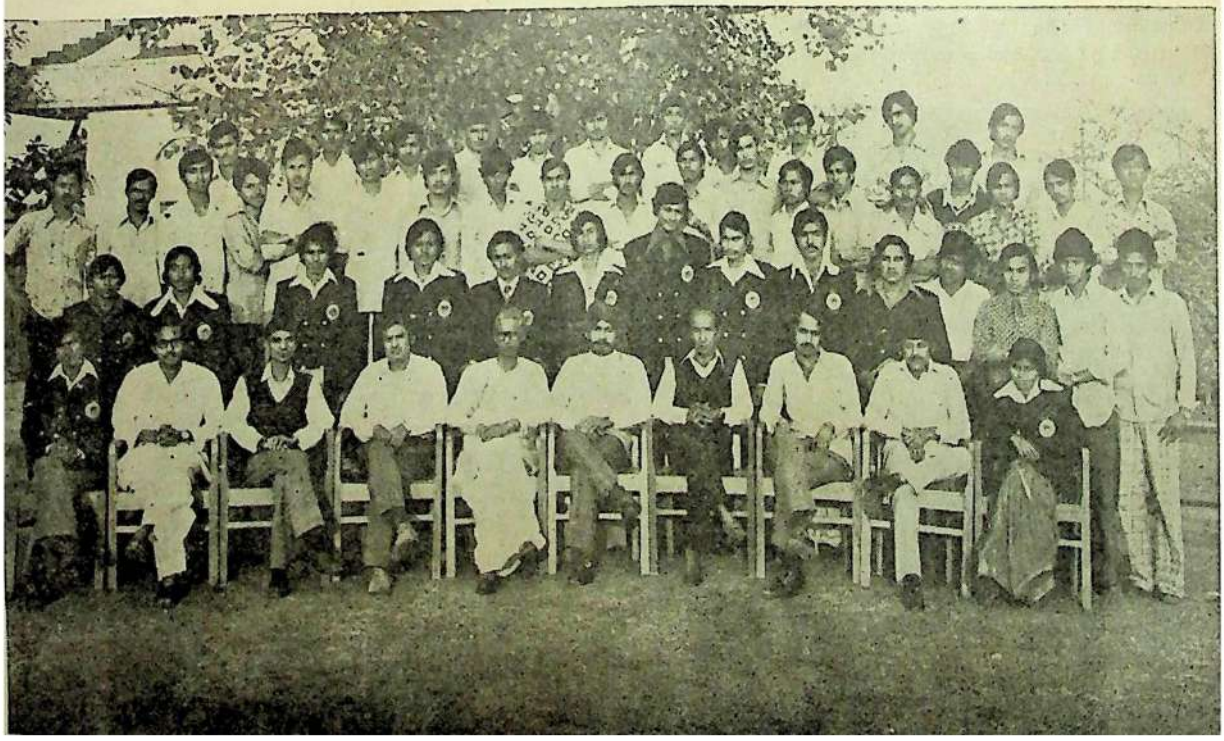
Mr. TAPAN NAG, best batsman and Mr. RAMEN HAZARIKA, best bowler of inter-class Cricket competition 1976. They are both P.U. 2nd year class students.

Sgt. ASHIM KR. DAS, (left) and Sgt. ARUP ROY CHOUDHURY (right) of I Assam Bn. N.C.C. Gauhati attend the All India Summer Training Camp held at Bangalore and completed the course sucessfully.

Sayed Mehdi Alam Bora, Best Debator of our college and also the winner of 3rd prize in Inter College Youth Festivel of G.U. 1976.

S.U.O. PARESH HAZARIKA and Sgt. BIRENDRA KR. CHOUDHURY (Photo is not available) were joined in the regular Army Attachment Camp with 6th Kumaon Regiment 1976.

GENERAL ASSEMBLY OF 1975-76



ARYA VIDYAPEETH COLLEGE STUDENTS' UNION 1975-76

L to R sitting—Prof. Sushil Kr. Borthakur. (Prof-in-charge, Major games), Prof. Birinchi Kr. Medhi, (Prof-in-charge ; Fine Arts), Prof. Anil Kr. Deb, (Prof-in-charge ; Boys' Common Room), Prof. Bhubaneswar Bhuyan, (Vice Principal), Principal Amrik Singh ; (President A.V.C.S.U.), Prof. Hemanta Kr. Choudhury (Prof-in-charge ; Students' Union, Music & Culture), Prof. Robin Talukdar (Prof-in-charge ; Debate & Symposia), Prof. Nareswar Sarmah (Prof-in-charge ; General Sports), Miss Mukta Probha Pathak (Secy. Girls' Common Room).

L to R Standing—Md. Safiqur Rahman (Secy. Major Games), Md. Azaduddin Ahmed (Secy. Minor Games), Pradip Kr. Dutta (Editor, "ARYAN"), Alak Sarmah (Secy. Debate and Symposia), Bikash Arandhara (Secy. Fine Arts), Dharanidhar Sangma (General Secretary), Bimalendu Choudhury (Secy. Music & Culture), Jitendra Kr. Thakuria (Secy. Literary Asso.), Dharani Talukdar (Secy. Social Service), Jugal Ch. Borah (Asstt. Gen. Secy.), Dwijen Thakuria (Secy. Boys' Common Room), Md. Abdul Hamid (Secy. General Sports.)

সমাজ সেৱা বিভাগ

আৰম্ভণিতে বিচাৰক মণ্ডলী আৰু অধ্যাপক অধ্যাপিকা সকললৈ মই মোৰ আন্তৰিক শ্ৰদ্ধা জ্ঞাপন কৰিলোঁ। এৰিয়ান বন্ধু-বান্ধৱী সকললৈও মোৰ অন্তৰভৰা মৰম যাছিলোঁ।

এই বছৰ সম্পাদকীয় প্ৰতিবেদন মই কি লিখিম একো ঠিক কৰিব পৰা নাই। কাৰণ মোৰ কাৰ্য্য কালত বহুফালৰ পৰা অসুবিধা হোৱাত মহাবিদ্যালয়ৰ উন্নতিৰ হকে কোনো কাম কৰিব নোৱাৰিলোঁ। তথাপি মই কিবা এটা কৰিব পাৰিম বুলি আশা ৰাখিছোঁ।

মহাবিদ্যালয়ৰ অতি প্ৰয়োজনীয় বস্তু কেইটামানৰ কথা আঙুলিয়াই দিব বিচাৰো। প্ৰথমতে আমাৰ মহাবিদ্যালয়ত কেইটামান ড্ৰাষ্টবিনৰ প্ৰয়োজন। যাৰ অভাৱত এৰিয়ানৰ বন্ধু বান্ধৱী সকলে য'তে ত'তে কাগজৰ টুকুৰা আদি পেলাই কলেজৰ পৰিবেশ নষ্ট কৰি পেলায়। দ্বিতীয়তে পেচাব খানাত ফেনাইল আদি দিয়াৰ ব্যৱস্থা হোৱা যুগুত।

এই কেইটা কথালৈ কৰ্তৃপক্ষৰ দৃষ্টি আকৰ্ষণ কৰি মই মোৰ প্ৰতিবেদনৰ সামৰণি মাৰিলোঁ।

ধৰণী তালুকদাৰ
সম্পাদক/সমাজ সেৱা বিভাগ

Report from Major games Secretary

At the very out-set I would like to convey my heatiest thanks to the Principal Amrik Singh and Prof. Staff, whoes kind consideration help me to be a Secretary of Major games.

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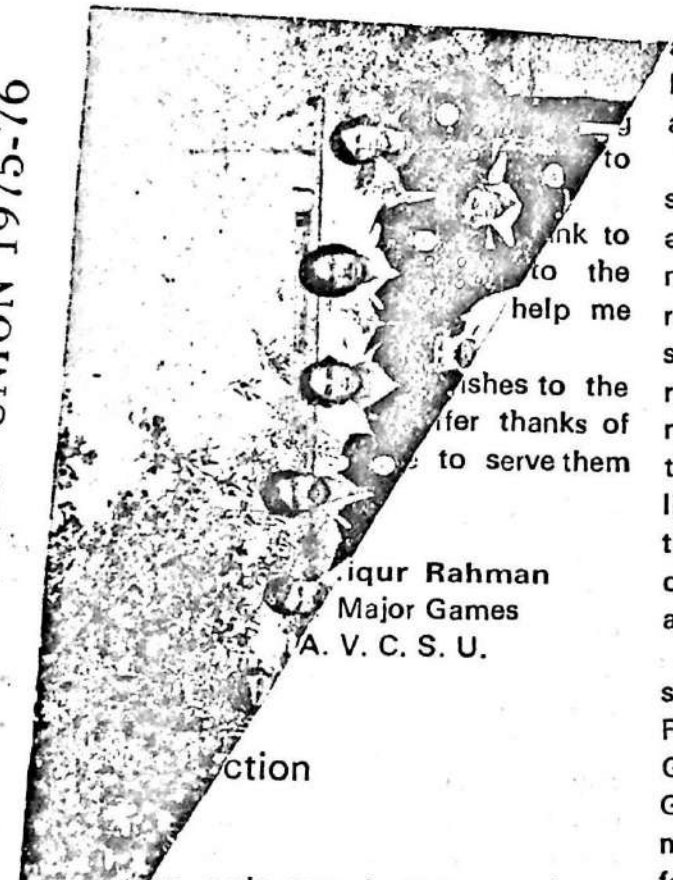
problem of the
Prof. in-charge S
proudly that I finish
my experience I can s
are more interested in
so I request the next s
some way to play cricket
any restriction. Prof. Rabin
one refree Sri Suren Ram
the prize distribution meeting
the prize to the players. Accor
ball and cricket. So I send my
thanks to both of them through thi
report.

There-after I arranged the college c
team to take part in Gauhati University
college cricket compitition. This year o
team entered in the quater final after beat-
ing Nowgaong College in pre- quarer final
by 46 runs.

In quarter final our college team was
qualified to play against Assam Engg. College
in Jalukbary, Assam Engg. College begged
the game by way of first inings lead our
participaters could impressed upon all by
there excellent performances. Specially J.



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iqur Rahman
Major Games
A. V. C. S. U.

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en a pleasure to serve my Aryan their Fine Arts Secretary for the 75-76.

course the first opportunity to prove f came during the last College Week ebration. Competitions were held in diffe- ot sections of Art and a fine arts exhibition was also organised. Shri Naba Kanta Barua, noted Assam se poet and professor, Depart- nt of English, Cotton College had kindly raced the opening ceremony of the exhibition as Chief Guest. After inagureting the exhibition, he spoke a few works of advice to the artists, ending on a note of encouragement.

As in previous years the participants in such competitions as painting, sketching, embroidery etc. were supplied with all ndcessary articles. Judging from the response recieved from the Aryans at large, one can safely assume that as long as this spirit remains, in a few years from now, quite a number of young artists are bound to catch the public eye at home and abroad. In the light of this I take the oppertunity to stress the need for an Art Gallery, the possession of which, I am sure, would encourage the amateur artists on to a brighter path.

In conclusion, I would like to extend my sincere thanks and acknowledgements to my Prof.-In-Charge, Shri Brinchi Medhi, Ex. General Secretary Shri Subash Deka, Present General Secretary Shri Dharani Sangma and my predecessor Shri Neelim Sovan Goswami for their valuable advice and help. My thanks also go to Ashok Sharma, Monoj Borgohain, Pronab Bailong and of course to all my Aryan friends, without whose kind co-operation and selfiess contribution I would not have achieved even an iota of success.

Bikash Arandhara
Secy. Fine Arts.

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* ব্যায়াম বিভাগ আৰু সঙ্গীত বিভাগৰ সম্পাদকৰ প্ৰতিবেদন সময় মতে আমাৰ হাতত নপৰাত প্ৰকাশ কৰিব নোৱাৰি আমি দুঃখিত।