

**ENVIRONMENTAL CONSERVATION EDUCATION PROBLEMS
IN INDIA**

PROCEEDINGS
OF THE
WORKING MEETING OF THE IUCN COMMISSION ON EDUCATION

held at

FOREST RESEARCH INSTITUTE & COLLEGES
DEHRA DUN. INDIA

21-22 November, 1969

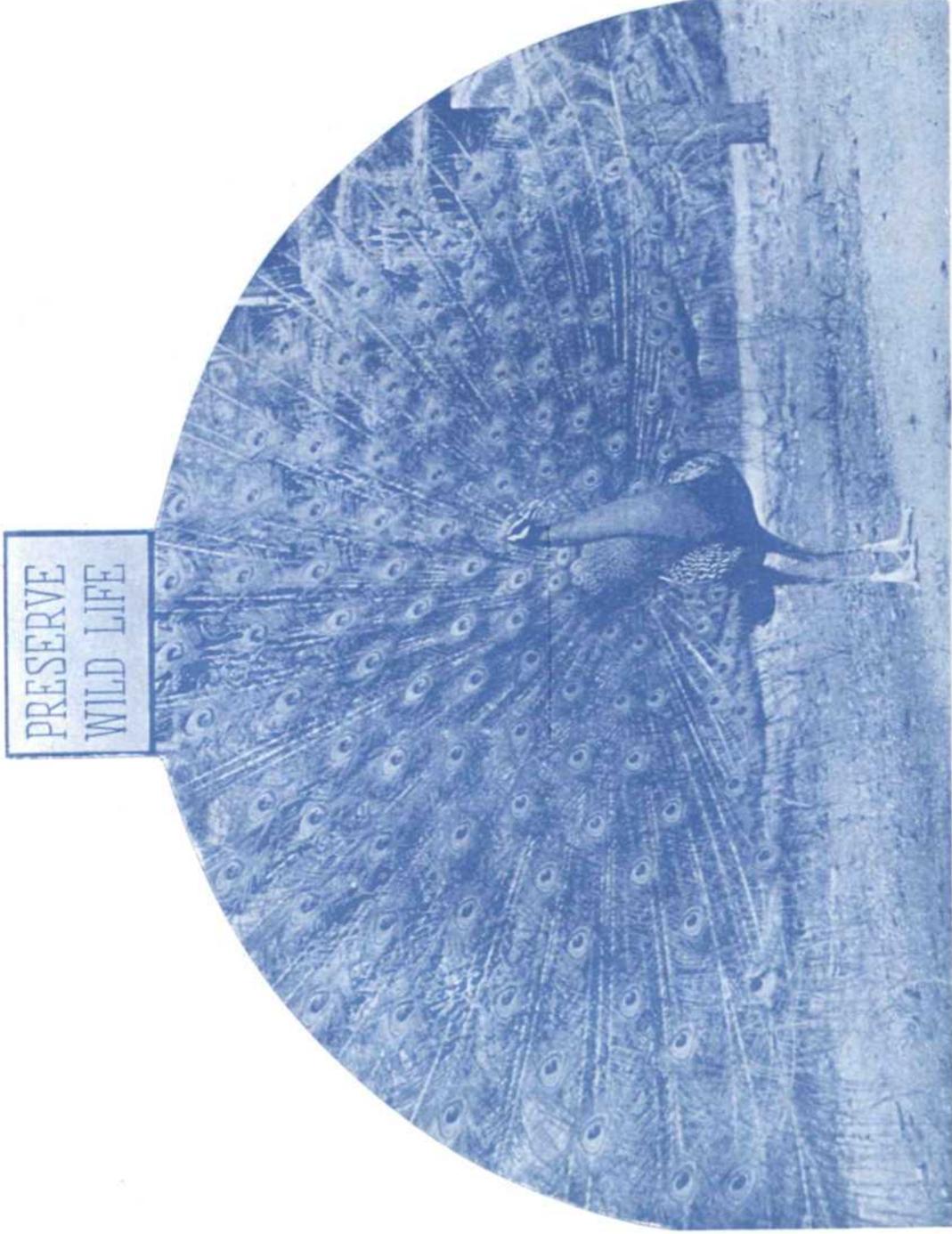


1948

**International Union
for Conservation of Nature and Natural Resources
Morges, Switzerland**

1970

Price : \$ 1.00



National bird of India—in its majestic dance pose

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INTRODUCTION

The International Union for Conservation of Nature and Natural Resources (IUCN) was founded in 1948 and has its headquarters in Morges, Switzerland; it is an independent international body whose membership comprises states, irrespective of their political and social systems, government departments and private institutions as well as international organisations. It represents those who are concerned at man's modification of the natural environment through the rapidity of urban and industrial development and the excessive exploitation of the earth's natural resources, upon which rest the foundations of his survival. IUCN's main purpose is to promote or support action which will ensure the perpetuation of wild nature and natural resources "on a world-wide basis, not only for their intrinsic, cultural or scientific values but also for the long-term economic and social welfare of mankind.

This objective can be achieved through active conservation programmes for the wise use of natural resources in areas where the flora and fauna are of particular importance and where the landscape is especially beautiful or striking, or of historical, cultural or scientific significance. IUCN believes that its aims can be achieved most effectively by international effort in co-operation with other international agencies particularly of inter-governmental nature such as UNESCO and FAO.

The Union is supported entirely by membership dues, by private donations and by grants from foundations, associations, private, governmental and international organisations, and individual Friends of the Union. Substantial support, however, comes from the World Wildlife Fund (WWF) which for all its activities takes scientific and technical advice from IUCN.

The WWF, an international charitable organisation, was established in 1961 for saving the world's wildlife and wild places. Its aim is to support the conservation of nature in all its forms (landscape, soil, water, flora and fauna) by raising funds and allocating them to projects, by publicity, and the education of the general public and young people in particular. Although WWF may occasionally conduct its own field operations it tries, as much as possible, to work through competent specialists or local organisations.

The support received by IUCN from the WWF since its inception has enabled the Union to increase its effectiveness and extend its activities. Among WWF projects financial support for IUCN and for the International Council for Bird Preservation (ICBP) have the highest priority, in order to enable these bodies to build up the vital scientific and technical basis for world conservation and specific projects.

IUCN operates through a number of Commissions and Committees, each of which specialises in different aspects of the Union's work. The Commissions are responsible to the Executive Board, a body of leading conservationists from various regions of the world, and the policies of the Executive Board are carried out by the Secretariat. The six Commissions are: Survival Service Commission, Commission on Education, Commission on Ecology, International Commission on National Parks, Commission on Legislation and Commission on Landscape Planning.

The Commission on Education has the following membership for 1969-1972 :

Chairman :	Dr. L. K. Shaposhnikov, U.S.S.R.
Vice-Chairman and Education Executive Officer:	Dr. J. Cerovsky (Czechoslovakia), Morges, Switzerland.
Vice-Chairmen :	Prof. O. A. Hoeg, Norway Dr. T. Pritchard, U.K.
Members:	Mr. J. L. Aldrich, U.S.A. Mr. S. Doraiswami, India Dr. E. P. Dottrens, Switzerland Prof. A. Eichler, Venezuela Mr. L. E. Esping, Sweden Dr. V. Galushin, U.S.S.R. Mr. J. Holliman, U.K. Mr. R. C. Kaushik, India Mr. E. J. Kesteloot, Belgium Dr. H. Lohmeyer, Germany Dr. R. Luti, Argentina Dr. A. Magnanini, Brazil Prof. M. Maldague, Canada Dr. R. G. Miller, U.S.A. Prof. R. Misra, India Prof. D. Morgan, Zambia Prof. M. Pavan, Italy Prof. V. A. Popov, U.S.S.R. Prof. G. S. Puri, U.K. Prof. A. K. Rustamov, U.S.S.R. Prof. N. Soyrintki, Finland Prof. J. Shimoizurni, Japan Dr. T. M. Szczesny, Poland Dr. R. C. Taruming Keng, Indonesia
Secretary :	Mr. J. Goudswaard, ing., Netherlands

Before the 10th General Assembly and 11th Technical Meeting of IUCN (New Delhi, India,, November 24-December 1, 1969) the Commission on Education, IUCN, organised a pre-Assembly Working Meeting on Problems and Programmes on Environmental Conservation Education in close co-operation with the Forest Research Institute and Colleges at Dehra Dun on November 21 and 22, 1969. The aim of the meeting was to have a discussion on environmental conservation education problems at different levels in India. Therefore, Indian specialists were invited to deliver the background papers and to participate in the discussions. Experts from IUCN's Commission on Education gave their views in this field during the discussion and helped in preparing the conclusions and recommendations. Three staff members and experts of UNESCO assisted at the meeting. Altogether there were 40 participants to this meeting (Appendix I) including representatives of IUCN, UNESCO, IYF, as well as Indian educators.

The meeting was chaired by Mr. R. C. Kaushik, President, Forest Research Institute and Colleges, Dehra Dun, India and Mr. Goudswaard, ing., Secretary of the Commission acted as the Rapporteur-General. Dr. J. Cerovsky, Vice-Chairman of the Commission and Education Executive Officer, IUCN, acted on behalf of Dr. Shaposhnikov as Deputy Chairman. Dr. T. Pritchard, Vice-Chairman, Commission on Education, IUCN, and Mr. P. P. Joshi, Publicity and Liaison Officer, Forest Research Institute and Colleges, Dehra Dun, India, assisted in conducting the business of the working meeting at Dehra Dun.

This volume contains the summary of discussions on the papers presented, resolutions and reports of the pre-Assembly Working Meeting of the IUCN Commission on Education, held at the Forest Research Institute and Colleges, Dehra Dun (India) on November 21 and 22, 1969.

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AGENDA

FRIDAY, NOVEMBER 21, 1969

MORNING SESSION
10.30 hrs.—13.00 hrs.

1. *Inauguration:*

Welcome by the Chairman.
Messages and Greetings.
Approval of the Agenda and the procedure of the Meeting.

2. *Background papers and discussions :*

Environmental Education—an urgent challenge to Mankind—Dr. J. Cerovsky.
Conservation Education in Schools in India—Mr. R. C. Kaushik & Mr. O. N. Kaul.
Problems of Conservation of Nature in the School Curriculum in India—Dr. S. Doraiswami & Dr. V. Galushin.
Conservation Education in Chemistry Teaching—Prof. S. A. Balezin.

AFTERNOON SESSION
14.30 hrs.—16.30 hrs.

3. *Visit to Wild Life Club, Indian Forest College, F.R.I. and Colleges, New Forest, Kendriya Vidyalaya, New Forest and Doon School, Dehra Dun.*

EVENING PROGRAMME
17.30 hrs.

4. *Film Show at I.F.C. Auditorium :*

- (i) Our feathered friends.
- (ii) Dances of Assam.
- (iii) Jungle Marauder.
- (iv) Call of Khedda.

SATURDAY, NOVEMBER 22, 1969

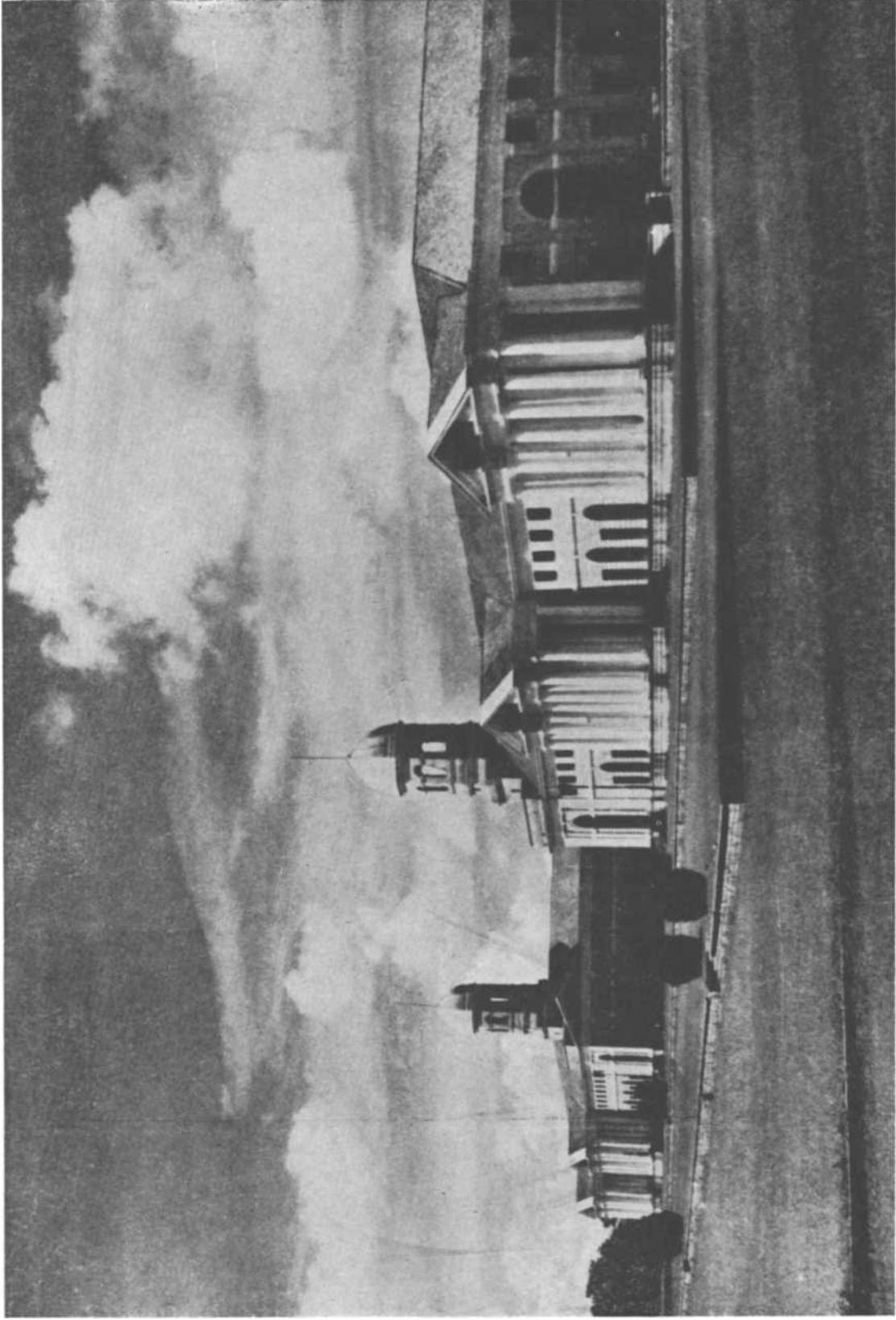
MORNING SESSION
09.30 hrs.—13.00 hrs.

1. *Background papers and discussions :*

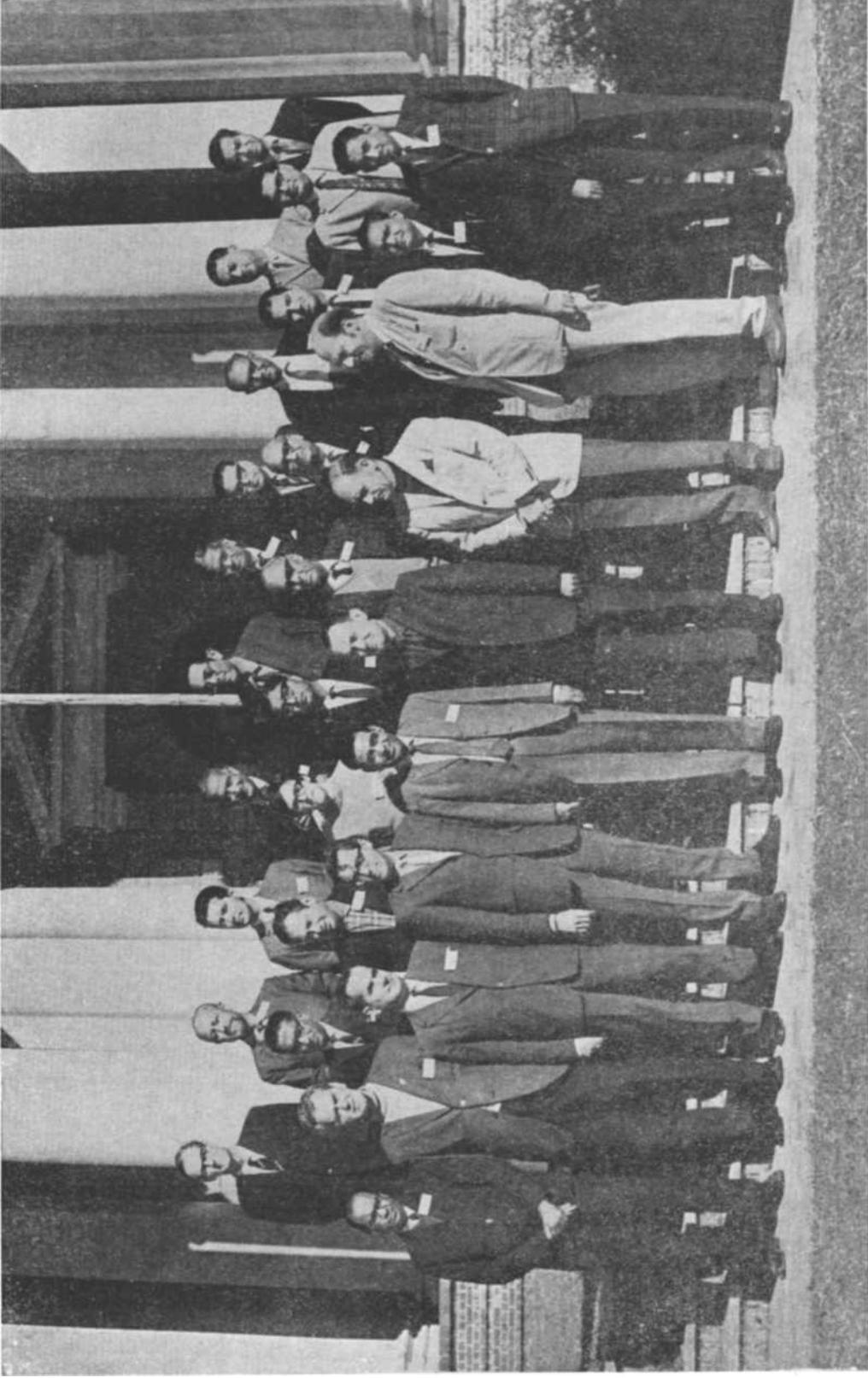
Nature Education in India—Mr. Zafar Futehally.
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University Education and Training in Nature Conservation in India—Mr. P. V. Rajamannar.
Forestry Education—*Primo Genitor* of Nature Conservation Concept—Mr. R. C. Kaushik.

AFTERNOON SESSION
15.00 hrs.—17.00 hrs.

- 2. *Closing remarks by Dr. J. Cerovsky.*
- 3. *Conclusions and approval of recommendations.*



Forest Research Institute & Colleges, Dehra Dun, India



1st Row — Mr. B. S. Parakh, Prof. Arturo Eichler, Doc. Dr. Tadeusz Szczesny, Dr. Tom Pritchard, Mr. R. C. Kaushik, Dr. J. Cerovsky, Dr. J. P. Doets, Mr. Johannes Goudswaard, ing., Dr. R. Negabhushanam, Mr. P. P. Joshi

2nd Row — Mr. M. B. Peter, Dr. Garardo Budowski, Mr. Jonathan Holliman, Dr. K. Krishnamurthy, Mr. P. D. Stracey, Prof. R. Misra, Dr. V. Kaul, Mr. T. N. Maharishi

3rd Row — Mr. C. J. Miller, Prof. Richard Gordon Miller, Dr. Vladimir Galushin, Mr. P. V. Rajamannar, Dr. Herbert S. Zim, Dr. S. Doraiswami, Mr. H. C. Day, Prof. P. V. Bole, Mr. M. A. Rashid, Mr. T. Krishnamurthy

WORKING MEETING OF THE IUCN COMMISSION ON EDUCATION
(Pre-10th General Assembly & 11th Technical Commission Committee)

SECTION I — PROCEEDINGS

FRIDAY, NOVEMBER 21, 1969

Inauguration

The session was opened by Mr. R. G. Kaushik, President, Forest Research Institute and Colleges. In welcoming Dr. Jan Gerovsky and Dr. Tom Pritchard, Vice-Chairmen of the Commission, other members of the Commission and the Indian participants, the Chairman said :

"I am deeply beholden to the Commission on Education of the IUCN for choosing the Forest Research Institute and Colleges, Dehra Dun, as the venue of this Working Meeting. Conservation of forests is a practical and widespread example of conservation of nature and natural resources. Our Institute and the Colleges, ever since 1878, when the Forestry School was established, have contributed substantially to the cause of nature conservation, in the fields of forest resource management and the related activities of Soil and Water Conservation and Wild Life Management. Holding this meeting here is a matter of honour to us and we deem it a recognition of the role this Institute played, and is continuing to play, in spreading the message of nature conservation. I am sure it will enable us to freshly focus the attention of all concerned on our common objective.

I am also deeply indebted to the Commission for giving me the privilege of presiding over the Working Meeting, and particularly so because it affords me the opportunity to extend a hearty welcome to the distinguished nature conservationists actively engaged in the task of improving the Nature Conservation Education facilities internationally. It gives me great pleasure to welcome the distinguished guests from the other lands and also the leaders in education from my own country.

The concept of nature and conservation of natural resources implies using our environment and resources for human welfare within the bounds laid by nature. Mother nature never deceives man. Only man deceives himself. He is often misled by a feeling of mastery over the environment which at best is a temporary one. Ignorance of true nature of the environment needs to be dispelled if more civilisations are not to meet the same fate as the once flourishing cultures of Mesopotamia, Assyria, Babylonia and others in the Middle East suffered. Nearer home, we also have ruins of Taxila and Mohanjodaro.

A wise saying by the great German Philosopher Goethe two centuries ago is worth quoting. He said "There is no trifling with nature; it is always true, grave and severe; it is always in the right and the faults and errors fall to our share. It defies incompetency, but reveals its secret to the competent, the truthful and the pure."

Population explosion has led to a very intensive exploitation of the environment and natural resources. For progress and prosperity and even for the very survival of human race a scientific climate to live in harmony with the environment must be created in a way that every individual learns to instinctively respect nature in the process of living. This can be achieved only through an intelligent integration of knowledge of nature, the factors of environment and the natural resources in the total education system.

The object of this meeting is to discuss Environmental Conservation Education problems in India. We have 8 background papers before us but much more knowledge would be gained in the discussions. Education at schooling stage is the most vital link which should receive our greatest attention.

We had, therefore, invited representatives from the State Education Departments who are responsible for school education. Their absence is a matter of great disappointment. I am sure it is not due to lack of perception of the need of nature conservation and natural resources. I assure the members of the Education Commission of IUCN that our country will take the maximum advantage of the knowledge that will become available to us through the deliberations of this Working Meeting and 'Education Workshop' on 30th instant, as a part of the general conference at Delhi.

Before we resume the work, I once again heartily welcome you all ladies and gentlemen."

The Chairman then invited the participants to convey the messages and greetings received from various individuals and organisations.

Message from Mr. R.C. Soni, Inspector General of Forests, India, was read out by the Chairman, as below :—

"I send my compliments to all the delegates of the Working Meeting of the Commission on Education of IUCN. I am prevented from attending the meeting as my presence at Delhi is inescapable. I wish the Working Meeting a success in achieving the goal before them."

Dr. G. Budowski, Programme Specialist for Ecology and Conservation from UNESCO, Paris, then expressed the great interest of his organisation. He said :

"On behalf of the Director General of UNESCO, I would like to convey to you his personal greetings and his recognition of the importance of this meeting.

India, with its tremendous variation in ecological, social and economic conditions is a particularly fertile ground for testing and evaluating conservation education programmes and the experiences here acquired will be of immense benefits for many other countries.

It is, therefore, UNESCO's sincere wish that from the papers presented and the resulting discussions, useful guidelines will emerge showing ways to 'infiltrate' ecological and environmental education into general educational activities at all levels".

Dr. J. Cerovsky, Vice Chairman, IUCN Commission on Education, conveyed the greetings of Dr. L. K. Shaposhnikov, Chairman of the IUCN Commission on Education in the following words :—

"I regret very much to inform you that our Chairman of the Commission on Education of IUCN, Dr. L. K. Shaposhnikov was unable to get a timely booking for his flight from Moscow.

He is, therefore, unable to be present in the first part of our working meeting. He asked me in a letter to apologise on his behalf and honoured me by appointing me to act as his deputy. In his name I have the pleasure to express the warmest thanks of our Commission to the Forest Research Institute and Colleges in Dehra Dun, its President, Mr. Kaushik and his staff as well as to all the other bodies and individuals who have done marvellous work in all the arrangements and preparation for this meeting. I also thank you all for your attending this meeting. This proves your immense interest to discuss the problem of environmental conservation education in India. This surely indicates your interest to assist the development of programmes in environmental conservation education in this country by considering here the recent situation and the needs, by promoting the future prospects and no doubt by creating a solid basis for continuing action. Our members who are enjoying very much their visit at this excellent establishment, are ready to contribute to the important papers and discussion of local specialists based on the information and the long years of experience in the field of our interest.

I have the pleasure to convey to all of you the warmest personal greetings from Dr. Shaposhnikov and his wishes of best success to this Working Meeting."

Dr. S. Doraiswami, National Council of Education Research and Training, New Delhi, on behalf of the Ministry of Education, conveyed the following message :—

"The Ministry of Education in the Government of India is very happy that this working meeting on conservation education is being held this year in India, and particularly in Dehra Dun at the Forest Research Institute today, on 21st November, 1969.

The Ministry wishes this meeting all success and hopes that the deliberations of this august meeting would be very helpful to India, particularly to the educationists in developing programmes of conservation education.

The absence of the State representatives is due to organisational and administrative reasons. Being held for the first time, they wait to receive the recommendations and report of this meeting and benefit by the same."

Mr. T. R. Jayaraman, Joint Secretary, Ministry of Education, expressed through a written message his regrets in being unable to be present. However, he assured the audience of his co-operation in the follow-up programmes.

The Chairman, eliciting the suggestions on the agenda and procedure of the meeting, said:

"The printed agenda is before us. This morning will be entirely devoted to the four papers pertaining to nature conservation education in school education. In the afternoon, we shall visit the schools and possibly snatch a few minutes to see the Wild Life Club which is maintained in the Indian Forest College, with the objective of teaching wild life conservation to the students.

Tomorrow morning the discussion on school education will be continued, because to my mind this is one of the most vital subjects for discussion before this meeting. Finally the discussion will be reduced in the form of definite recommendations.

A few words about the procedure for discussion. To read the papers will become rather taxing. So the best is that the salient points may be given by the author and then the paper can

be thrown open for discussion. For the sake of accurate recording of the discussions I have a suggestion that every speaker might reduce the gist of his observations in writing and pass them on to my friend Mr. Goudswaard for incorporating in the proceedings. This will enable us to be exact in recording the proceedings. If all of you gentlemen approve, we will adopt this procedure.

I may also point out that for drafting the recommendations of this meeting, it will be desirable to group these under : Nature Conservation Education in schools ; Nature Conservation in general—university education pattern and Nature Conservation Education in professional courses. It is necessary to distinguish between the normal university education and the professional education. If enough material comes forth in the discussion about 'out of school education' for adults or those who did not have advantage of school education, then we can have a small committee for recommendations on this aspect also, because after all even the so-called extension approach is educational approach. For each committee we will elect the members.

If there is any suggestion by any friend about the agenda and the procedure, it is most welcome.

The silence indicates that it meets the approval of the delegates."

Presentation of Papers and Discussions

CHAIRMAN : "We will now commence our business and I request Dr. Cerovsky to present his paper."

Environmental Education—An Urgent Challenge to Mankind—(Dr. J. Cerovsky)

DR. J. CEROVSKY (IUCN headquarters, Switzerland) introduced his paper with these observations:

"I have taken the liberty of presenting to you a rather lengthy paper which tries to outline some very general features of the IUCN thinking about environmental education and its ideal system. This system is to be implemented according to the national or regional, some times even local, conditions. You may go through it if you find it interesting and useful. I would like to point out only a few items.

In recent years, the total deterioration of human environment, in the first place of its natural component, became the most urgent challenge of mankind, being a question not only of its present and future economical, physical, mental and social welfare but also of its survival at all. This was highlighted by UNESCO (particularly during its Biosphere Conference, Paris, September 1968, and its follow up, the preparation of an international, inter-governmental, inter-disciplinary programme on "Man and Biosphere") and, further, even by the United Nations (Agreement on U. N. Conference on Human Environment in 1972).

By 'Environmental Education' we understand all kinds of education and information which aim at creating the correct approach of Man to his (natural) environment in the sense of conservation, wise use and management. Although the "ecological thinking" is the basic feature of this correct approach and, consequently, of the environmental education, this education by far cannot be only a matter of science, and specially biology teaching. Environmental education, coincidentally with the modern conservation of nature and natural resources and landscape planning

and management, including not only scientific but also broader cultural, economical, hygienical, aesthetical and ethical aspects, is an essential part of general civic, moral and liberal education. By its ideology, it has to determine Man's philosophy, his relationship to nature and landscape, using them as the basic component of the whole environment. It has to influence and even to form Man's correct behaviour and action in the wise use of his environment, providing with basic principles and rules of such behaviour and action. Facing the dangers of many-sided environmental pollution and deterioration in our modern world, this philosophy and rules of action are of equal importance as the mental and physical hygiene, being, in fact, also a component of it, as Man himself is the most valuable and powerful resource of the Biosphere.

The environmental education, in order to be effective, has to be carried out as a united education system (including children, youth as well as adults), formal education at all levels (pre-school, primary and secondary schools, high schools, colleges and universities), out-of-school education, etc., and it has to be well integrated with the general educational systems.

Environmental education, at its present development stage, does not exist as a necessary, integrated, continuous and sustained programme. The elements of it occur in science, especially biology, and are developing at some universities (special Chairs and Institutes), within the activities of some youth and adults, voluntary organisations, promoted by some mass media. However, there is, in general, a lack of proper integration.

It is important to have an integrated environmental education system. There are, however, some items which deserve the highest priority. According to our opinion, teachers and other educators should be given further (post-graduate) education in the role of ecology and creative conservation; and this should also be included in the university training of technologists (engineers), sociologists, economists and politicians."

Summary of Discussion

MR. P. D. STRACEY (India) queried the role of private organisations in the task of conservation education. His attention was drawn to paper "Nature Education in India" by Mr. Zafar Futehally (of the Bombay Natural History Society) wherein the problem for India has been comprehensively dealt with.

DR. G. BUDOWSKI (UNESCO, Paris) asked: "How is it possible to overcome the difficulty to introduce environmental education in what are already crowded curricula, often "departmentalized" in such a way that it is difficult to bring in something additional?"

DR. S. DORAISWAMI (India): "It is very difficult to introduce new disciplines in the already overloaded curriculum, like conservation education, population education and health education. My suggestion would be to introduce as many concepts of conservation education as possible within the existing disciplines of biology, chemistry and other disciplines. The suggestion that the teachers could receive training in programmes of conservation education is a sound one. Perhaps we could organise in-service training courses on conservation education, such as Refresher Courses and Summer Institutes. The professional institutes could also help in organising Training Institutes".

DR. HERBERT ZIM (U.S.A.): "Attempts to include a variety of related but extraneous subjects into Science programmes in American schools have led to weakened and ineffective

curricula. Recently, scientists have "revolted" and have sponsored re-organized programmes based on fundamental concepts in biology, physics, chemistry and general science.

If environmental education is as important as we assert, it should include concepts of such importance that programmes built on them deserve a central role in general education at all levels. A technique of gradual introduction of bits of this material into other courses is not likely to achieve results."

PROF. S. A. BALEZIN (UNESCO, India) : "The participation of Scientists (Physicists, Chemists, etc.) and representatives of the industries, who often had until now adopted a negative attitude to nature is very important in the future work for conservation education of the Commission, and should be encouraged."

PROF. R. MISRA (India): "Simple ideas of inter-relations of man, nature and environment can be put in all science and humanities curricula developed for schools."

CHAIRMAN: "The delegates are probably thinking ahead of Dr. Cerovsky. Dr. Zim has given the example where by introduction of too many things in the curricula they lost their real and correct approach and shape. Here our objective of discussion is the problem of conservation education in India. Perhaps a more fruitful discussion could be had after the other papers come up which provide the necessary information on the contents of the curricula of our school education."

DR. J. CEROVSKY (IUCN headquarters, Switzerland): "The points of discussion have been answered by Mr. Kaushik. Regarding the question raised by Prof. Baiezin, concerning the invitation of those inimical to our working meeting, I feel that this working meeting has to discuss the programmes and outline some programme. In this sphere, it is much better to have here only some converted specialists and educators because we must build a basis by ourselves and then we can go into discussion with people whose opinion differs from ours."

Conservation Education in Schools in India—(Mr.R. C. Kaushik & Mr. O. N. Kaul)

MR. R. C. KAUSHIK (India), presented the paper with the following remarks:

"With a view to evaluate the extent of nature conservation in school education curricula, as a nature conservationist, I took upon myself, more for self education, the task of surveying the curricula of school education systems in North-Western India in the States of Jammu and Kashmir, Himachal Pradesh, Haryana, Punjab, Delhi and Uttar Pradesh covering about one-third of the total population of the country.

It will be seen that nature conservation education finds a place both in social studies and general science curricula and also in the applied side of agriculture. Physical and Commercial Geography, Economics, Agriculture and Biology are the main subjects in which a good amount of nature conservation is being taught at the high school stage, and as we go down to the lower stages, naturally simpler elements of nature conservation find a place in the curricula. The National Council of Educational Research and Training (NCERT) has been quite active and this has led to the formulation of curricula, which, to my mind, have not got distorted to the extent that Dr. Zim complained pertaining to his country. They have introduced a fairly good element of nature conservation education, weaving it into the general subjects rather than having pointed emphasis on nature conservation.

The impact of teaching depends almost entirely on the quality of teacher. Even if there are no teaching aids, good teachers can always find suitable substitutes. Unfortunately the teachers responsible for teaching the subjects are not clear of the concept, and they mechanically teach the ad hoc information incorporated in the curricula, without analysing the material before conveying it to the students. This is a serious weakness amongst the teachers, which needs to be removed.

This brings out the question of studying the curricula of Bachelor of Education, Junior Teacher's Training and Bachelor of Training Courses. The Education Commission in India has taken a note of this aspect in their report for changing our education system, and have already prescribed that science teachers should be given a separate and comprehensive education to be able to create a scientific climate amongst the student community in the country. With this aim in view, our NCERT, which Dr Doraiswami represents, is organising a number of seminars, and workshops for the science teachers. The weakest spot in our system is the teacher community in the rural areas, who do not understand the biological concept in a practical way; and their teaching is more or less mechanical. What is needed is that the NCERT should tackle this problem on a large scale, because the brief courses organised by them in the shape of seminars are being attended mainly by teachers from the urban areas, and this does not help the rural teacher community.

The text books developed by experts of the NCERT are good, and the curricula incorporating the portion pertaining to nature conservation have been very well put.

Coming to the teaching aids, these can be best conceived and produced by the teachers themselves. Although we have already developed quite a few, but many more need to be developed and made available on a much larger scale. This aspect should receive greater attention of the educational authorities, so that every school has adequate teaching aids.

To remedy the shortcomings among the teachers, naturally a different approach is required for those who are yet to join the teaching profession, those who joined recently and those who have been in the line for a long time. Those who are now coming in are certainly better equipped than those who have been in education for the last 15-20 years or more. So, a different approach to train these "old guards" is important, because they are the senior men; and, unless they are trained properly, they may not really assist and help the new entrants in the right direction. So, the old guards have to be *specialy* trained.

The curricula given in this paper indicate that nature conservation courses of adequate breadth and depth have been introduced in the syllabi; and even if this much is properly conveyed to the students, in my opinion, the object of nature conservation education in our stage of developing economy will be fully realised. Nature conservation education must become widespread in the process of general development, so that the resources and the environments are not damaged in the process of their intensive utilization. As a matter of fact, most of the development in the school curricula, incorporating the concept of nature conservation, has taken place only recently.

I may also point out for the information of the delegates from other countries that at present we have three distinct types of school education. The first one is the Public School education, represented by Mr. Miller, Headmaster of Doon School. This education is really the

best and the most comprehensive education; teachers are well paid. Public School children, as you will see yourself today, are very well educated in nature conservation.

The second system is the normal State education system, which is the most widespread, under the control of a Board of School Education. Of this system, there are two varieties ; one is the Higher Secondary, i.e., 11 years of schooling, and the other is the 10-year schooling, with one year of pre-University education, before going to the University.

The third system is the Central School system, being followed by about 120 schools in the country at present. These schools, are, in fact meant for Central Government employees who get transferred from one State to another, so that the children would not face the problem of local, regional or State languages being the medium of instruction. Central Schools impart instructions in Hindi, and also in English. Although these schools are affiliated to the Central Board for the Higher Secondary Education, their curricula and the syllabi as regards nature conservation are practically of the same standard as in the Public Schools."

The Chairman then requested Dr. Doraiswami to present his paper and suggested that the discussion on both the papers could be taken up after his paper.

Problems of "Conservation of Nature" in the School Curriculum in India—(Dr. S. Doraiswami and Dr. V.I. Galushin)

Dr. S. Doraiswami (India) introduced his paper with these remarks :

"The importance of nature conservation has already come to be realised and needs no further stress. This concept is gaining importance in rural areas as well.

Biology, as it was being taught hithertofore, did not create the awareness of the impact of human society on the balance in Nature. Man has also been largely responsible for the destruction of natural environment. In addition to the well known reasons for this destruction, there are some other contributory factors, viz., natural calamities like outburst of the monsoons, pressure on land for production of food and cash crops, clearances in rural areas for installation of various projects for technical advantages, etc. All these factors had resulted in the recession of forests. It has been realised by the NCERT that the best area to begin conservation education is in the schools.

Many of the ideas of conservation education have been woven into the syllabus at three levels: Primary School Stage, the Secondary School Stage and the High School Stage. Some elements on topics of conservation of plants, animals and soils, and prevention of air and water pollution have been included. In the new syllabus developed by the NCERT team with the assistance of UNESCO experts, we have found that the concept of conservation of nature could be better emphasised by bringing before the children the idea of extent of natural resources available in the country and their gradual diminution by the intervention of man, and thus inculcate in them love and respect for nature and the things surrounding them.

The syllabi for schools have been prepared at three levels; the Primary level, classes 1-5 (ages 5 + to 10 +); the Middle School level, classes 6-8 (ages 10 + to 13 +) and the High or Secondary School level (ages 13 + to 16 +). Topics concerning conservation of plants, animals, soils, air and water are included and environmental approach runs through the

entire biology course. Special chapters on Ecology are confined to the syllabus for the High Schools. These give the students a basic knowledge on the close relationship and inter-dependence in nature.

In the Primary Schools, the general science course has topics on conservation of water, air and soils and some facts about plant and animal life. When dealing with soils, the concept of erosion and its control, are introduced. The pupils are made aware of the diversity of plants and animals and their adaptation to environment, and to each other. The importance of plants and animals is also stressed.

In the Middle Schools a systematic study of plants, animals and man is started. Each chapter on Biology in class VI and class VII includes material about conservation of plants and animals; e.g., in the Botany course in class VI, a chapter on "Plants and their Environment" provides pupils with definite ideas of rational and careful use of plants. In the Zoology course, chapters on fishes, birds and mammals include special topics concerning nature, and natural and economic significance of the groups. In the last chapter of the Zoology course, special emphasis is laid on the inter-relationship of the living and the non-living things and the dynamic equilibrium in nature. At this stage, the pupil should understand the necessity of conservation of nature as a whole and cultivate a sense of responsibility for careful treatment of nature and natural resources. The materials are supported by curriculum guides, which give the teacher extra material and extra enrichment information with which to handle the questions by the pupils. In class VIII, the Biology course concludes with an important section about man and his environment; this is a summary of the entire Biology course from an ecological angle, and also serves to bridge the Middle School Biology and the High School Biology. The last part of this section is "Man and Conservation of Nature". Thus conservation education runs through the entire syllabus and also forms a part of the final section of Biology course of Middle School."

Summary of Discussion

CHAIRMAN : "The two papers are open for discussion."

DR. S. DORAISWAMI (India): "I have some comments to make on Mr. Kaushik's interesting and stimulating paper. I am happy that Mr. Kaushik has given a panoramic view of the prevailing systems of education and the syllabi in Indian schools. I, however, feel that instead of three systems of education, it will be more appropriate to say that there are as many systems of education as the number of States in the country, as Education being a State subject, the curricula and the structure of education vary from State to State, and even within each State there may be two or three structures. This creates problems in bringing about uniformity in the education system. The NCERT is only an advisory body at the Centre. By and by more people are veering round our programme, and purposeful dialogues have been started between the representatives of the States and the Centre.

Regarding the Public School education, I support Mr. Kaushik's views, except on one or two points, viz., that it is serving only a very small population, and that the curriculum and the system of teaching, particularly science subjects, though good, are exotic. It is not related to the local environment. The text-books followed are written by foreign authors, and their concepts are rigidly followed. However, some of these schools, particularly in Delhi, are now changing

this practice and have switched over to the material prepared by NCERT. Many of them are following the Higher Secondary pattern instead of the Indian School Certificate pattern.

The teachers are not complacent; they are trying to keep up with the developing trends by participating in Summer Institutes, refresher courses, etc.

Central Schools are following the books prepared by NCERT in entirety and it is a matter of satisfaction that they find these to be the best in the market.

As regards the States there is another scheme, in addition to the UNESCO assisted programmes, which is assisted by the UNICEF, under which States are to receive massive aid in the shape of money, equipment, teachers training, text material, etc. NCERT has been commissioned to prepare material for the same and the States, if interested, are free to adapt the material to suit their particular needs, there being no compulsion of any sort. They may translate the material into regional languages, with the assistance and collaboration of the NCERT. Ultimately some sort of uniform pattern may evolve.

With regard to teachers' training, this programme also envisages the formulation of pre-service and in-service syllabi both at the Teachers' Training Colleges and Primary Teachers' Training Schools. NCERT has followed the recommendations of the Education Commission presided over by Dr. D.S. Kothari which envisaged 10 years schooling and some amount of science for all, and not Science as an elective subject as in the Higher Secondary pattern. It is aimed at, what may be called, scientific interest; where the students may have to learn all the sciences, Biology, Chemistry, Physics and Mathematics in addition to languages and Social Sciences. Many States have switched over this system, some are in the process of change over but there are still some sticking to the old pattern.

I have placed on the table some of the text books for the middle schools in all the three sciences, prepared by our study group headed by University professors and teachers in the NCERT. A copy of the Journal, "*School Science*", is also exhibited. This Journal is catching up slowly, and more and more students are subscribing to it. It is primarily meant for the teachers, though there are some articles for the students also."

CHAIRMAN: "I would like to remark that the criticism regarding the nature of text books in Public Schools is rather exaggerated. The criterion to assess their utility should be the results produced. Of all the categories of school going children, those studying in the Public Schools are the most conscious of the various aspects of nature conservation. It is gratifying to note that the authorities responsible for the formulation of the curricula are laying emphasis on inculcating a sense of perception of nature and its conservation amongst the children; and the lacuna pointed out in my paper will be soon eliminated at the High Schools level. When this is achieved, we would have reached a standard of nature conservation education, which could serve as a model for the developing countries."

DR. TOM PRITCHARD (IUCN, U.K.): "I have been greatly impressed by the last two papers, particularly by the depth of thinking behind your ecological approach in school education. What is also particularly significant is the fundamental difference in the situation in a country, such as India, where the majority of people live in the countryside and whose life is directly affected by the conditions of the environment in which they live and work, and the situation in continents such as Europe. In Great Britain, for example, over 90 per cent of the people lived in the towns and

cities. Less than 5 per cent of the population was directly concerned with the production of food. The social and economic structures are radically different in such an urban/industrial society. Thus, there are educational implications, including problems of methods etc., which will have to be tackled differently. Some of the attitudes and approaches amongst Indian educationists are relevant to developments in Europe. The difficulties which arise from urbanisation and industrialisation which the European is now well aware of, should also be studied by those in India concerned with environmental education, particularly in the light of growth of industry in the country and its actual potential impact on the environment. I hope a dialogue on these 'rural' and 'urban-industrial' experiences can be developed during this conference."

DR. J.P. DOETS (Netherlands): "I support the feelings of Dr. Pritchard concerning the modern concepts of the papers, and would like to emphasise the use of Social Science, particularly the modern methods of these sciences, attitude and motivation research and the modern ways of evaluation of the results of that research."

DR. V.I. GALUSHIN (UNESCO, India): "I would like to draw the attention of the participants to an ethical or even moral aspect of biology teaching concerning a number of experiments involving the killing of animals. Such experiments should be reduced or changed in such a manner so as to prevent children to be eager to kill animals for "scientific aims". It is especially important in India as there is a desire not to destroy wild life. Therefore, in the biology materials prepared by the NCERT we have dropped out some of these experiments and reduced others to minimum."

MR. P.D. STRAGEY (India): "I may admit that my deep pessimism regarding the future of wild life may have been somewhat misplaced, but the question arises whether it will not be too late, and whether there will be any wild life left till then."

Regarding the role of teachers in imparting conservation education, I would like to add that merely including the subject into curricula and syllabi will possibly result in mechanical teaching by teachers uninterested in the subject. There is an urgent need for 'missionary' type of teachers."

DR. S. DORAISWAMI (India) : "I am glad Mr, Stracey referred to the remarks of my paper that it would take about 10-20 years for our efforts to help in prevention of destruction of Nature. The number of schools in our country is enormous, but we have made a beginning in our dialogue with Education Departments of the States and they would be trying NCERT materials in 5—10 per cent of their schools in the first instance. Education being a State subject, no one could force any State into a programme of structure of education. It can come only after conversation and dialogue between the States and the Centre. But the movement in the right direction has begun and in course of time would spread and cover the whole country."

There is no steam roller attitude of the NCERT syllabus as has been suggested. As a matter of fact, NCERT has realised that there cannot be one type of syllabus for this vast country. We always confer with State authorities and it is for them to adopt or adapt the materials and syllabi prepared by the NCERT. Such dialogues have already started and are proceeding smoothly.

As one of the out-of-door activities, schools could organise "Young Naturalists Associations" as in U. S. S. R. These Associations could have some programmes on Conservation Education."

CHAIRMAN : "From the discussion, it has become obvious that a big social and organisational problem is involved in making nature conservation education programme effective. Mr. Stracey has very rightly emphasised that merely preparing a syllabus is not enough. The acceptance and the actual use of the syllabi and text-books has to be really widespread. So the problem in a country like India is gigantic one."

PROF. R. MISRA (India) : "The problems of conservation education in urban and rural areas differ as the education has to be correlated with the environment. The syllabus need not be very uniform.

State Forest Officers should be supplied with demonstration materials, and advised to visit schools so that they could educate the neighbouring school children.

Every State in the country must have a unit for planning of curricula for the schools.

Field observations, zoos, museums, etc., should be used for the study of interactions between organisms and their environment."

CHAIRMAN : "The syllabi and the curricula provide a basis for conservation education. These are the means and not the end. These have to be evolved for different regions and States according to the prevailing circumstances. Ultimately it is the teachers' method of presentation of the subject to the children that matters. Considering the magnitude of the problem in our country, the work being done at the NCERT, Delhi, provides only a foundation for further work locally. Education being a State subject, school education is the responsibility of State Education Departments, and as such participation by representatives of the State Departments in this meeting would have been beneficial. Anyhow the fact remains that there is urgent need for evolving and adopting new syllabi for the Central Institutions and for adopting the suggested guidelines by the State Departments according to the local conditions.

The Boy-Scout movement is common to both the rural and the urban areas. In U.S.A., Boy-Scout organisations have regular badges for nature conservation, forestry, wild life conservation, birds and animals studies and so forth. In the extra-curricular activities of our schools also, a lot can be done on similar lines to inculcate the spirit of nature conservation. This can be one practical approach, apart from the prescribed syllabi and curricula.

There is no denying the fact that the curricula for the urban and rural areas have to be oriented to the local conditions, but this calls for the active participation of a very large number of people engaged in education at all levels, because the syllabi can not be evolved, on the correct lines, merely by those responsible for policy or for administration. It is again the teacher himself who has to play that role; and this in turn highlights the question of teachers' training.

Prof. Misra has referred to the role of forest officers in the conservation education of the school children. The State Forest Departments are conscious of this, and in the majority of the States, Forest Publicity Units have been established. Their main assignment is to deliver talks, exhibit films, display charts and models, project slides, etc., on various aspects of nature

conservation in the educational institutions and elsewhere. Such organisations will have to be expanded. My personal experience in Soil Conservation Divisions in the Punjab Forest Department regarding the utility of such publicity is very encouraging. Even the uneducated people started showing appreciation of the effects of soil and water losses due to certain faulty land use practices. So this is a good idea which Prof. Misra has suggested; and our conference perhaps can recommend the strengthening of such organisations for the spread of nature conservation education."

The Chairman then requested Prof. Balezin to introduce his paper.

Conservation Education in Chemistry Teaching—(Prof.S.A.Balezin)

PROF. S. A. BALEZIN (UNESCO, India) introduced his paper as:

"In the context of the rapid advancement in chemical and related industries, it is essential that while studying chemistry, it is necessary to know, along with the benefits that chemistry gives, the destructive effects caused by chemistry and the chemical industry, by polluting the air, water and soil, through chemical wastes, industrial polymers discharge, radio-active wastes, etc. The human community is under the threat of catastrophic destruction of nature; it is necessary for every human being to realise the scope of the impending disaster from his childhood and be aware of the elementary measures aimed at the conservation of nature.

Modern methodology makes it possible to eliminate harmful effects of discharged gases and to extract valuable products therefrom.

It is, therefore, necessary to take suitable steps for :

- (i) A systematic study, on a compulsory basis, of Chemistry, Physics and Biology as individual science disciplines for all children of school age.
- (ii) Inclusion in the syllabi and text-books of the topics connected with the conservation of nature as an obligatory material.
- (iii) Wide publicity and propaganda of the nature conservation measure.
- (iv) Organisation of research on the development of methods of conservation of nature.

Text-books of Biology, Physics and Chemistry which are being prepared under UNESCO Secondary School Teaching Project in India, keep the above objects in view. The problem needs to be solved on a global scale, with the combined efforts of engineers, scientists as well as the statesmen."

CHAIRMAN : "Before we conclude the day's proceedings I would suggest the names of Dr. S. Doraiswami (Convener), Dr. V. Galushin, Prof. R. Miller, Mr. P. D. Stracey, Mr. C. J. Miller, Headmaster, Doon School and Mr. S. L. Khanna, Principal, Central School, New Forest, Dehra Dun to be the members of drafting committee for recommendations on school education."

SATURDAY, NOVEMBER 22, 1969

The Chairman opened the day's proceedings by inviting discussions on Prof. Balezin's paper presented on the previous day.

Summary of Discussion

DR. HERBERT S. ZIM (U.S.A.): "Dr. Balezin's paper strikes a new and important note of urgency. He speaks of the possibilities of "catastrophic destruction" and offers examples from the field of Chemistry. Experts have pointed out many more, involving insecticides, pesticides, chemical fertilizers, industrial and radio-active wastes, etc. The effect of these on the environment and on all living things is a matter of grave concern and Dr. Balezin has done a service in adding this important dimension to the picture of conservation education.

His proposals, however, tend to stress modification of secondary school courses (Chemistry, Physics and Biology) to include pertinent information. Much more can be done however. Very young children enjoy and learn from first hand experiences with air, water, soil and many simple materials. The concept of pollution is easily developed in this frame of reference. Older children can deal directly with such problems in their own homes, schools and communities. Involvement in such activities creates an awareness and a concern with the environment which moves directly into specific environmental studies on an adult level.

The shared aspects of our total environment—air and water—are specially vulnerable to degradation. Educational efforts to work on these areas specially are well worth making. The awesome potential dangers from radio-active wastes, (and weapons) may require adult action but even middle school students can get some grasp of the problem."

CHAIRMAN : "The immediate question before the meeting is, in fact, nature conservation education in schools. Dr. Balezin's paper brings out that Chemistry is not entirely useful, and the younger generations should also know about the ill effects of Chemistry and chemical industries. However, expansion of the school syllabi, without detriment to the core of the subjects is not easy. Perhaps a certain amount of slant in that direction will not distort the syllabi very much. So to that extent its introduction in the school education is worth consideration. However, the details of the chemical actions and reactions which follow would be too much for the school children".

DR. TOM PRITCHARD (IUCN, U. K.): "In the U. K. a few quite exciting educational experiments involving chemists, technologists and biologists working as a teaching team provide some examples of the scope for studies on the impact of industry on the natural environment. In one case, biology and chemistry teachers, their pupils from a secondary school, joined forces to study the effects of pollution from coal waste on a natural reserve. This included clinical analysis of polluted water, pH gradients and other physico-chemical factors, relating these to the biological changes in open water and marshland. Another interesting initiative is that taken by the Central Electricity Generating Board, local schools and the Nature Conservancy's Education Advisory Section, in establishing a fixed centre for schools in the grounds of one of England's largest power stations at Drakelow. This project has received widespread publicity partly because it shows how these aspects of environmental education that are very relevant to an industrial society can be pursued in the urban industrial environment. The power station and the ecological factors in the land surrounding it feature in the teaching programme. I shall be glad to give anyone interested further details of these activities".

MR. J. HOLLIMAN (U. K.) : "We must remember that biological sciences do not have a monopoly of education in conservation. In geography, for instance, 'human ecology'

'population and resources' and 'environmental determinism' are common themes. These themes are not peripheral to the subject but are basic to the whole concept of the geographer's integrated approach. Thus social studies and geography can easily integrate many of the ideas which conservationists wish to put. At the moment it is up to biologists and others to help social studies to define in clearer terms the ecological approach that is necessary."

CHAIRMAN: "From my and Dr. Doraiswami's papers, and the discussions thereon, it is evident that some aspects of nature conservation are included in the syllabi for Humanities subjects. Geography being one of these subjects, naturally as much nature conservation material should find a place in the subject of Geography as possible, for the benefit of those students who depend entirely on the study of Humanities. If we look at the syllabi, and as has been pointed out by Dr. Doraiswami, this aspect is already finding a place in the formulation of the syllabi. However, some more emphasis should be given to it".

MR. B. S. PARAKH (India) : "The subject of Geography in Social Studies and Humanities can also contribute a lot in promotion of conservation education. The subject stands central to conservation education. It encourages appreciation of the landscape, its evolution and the various components of which it is made. It is very much concerned with conservation of soil, water, natural vegetative cover, animal life and minerals.

Conservation of nature is a way of life, a philosophy which has a definite social component. The conservation education has better chances of success, if it can find a place in general education. Since the subject of Geography is well entrenched, and a teacher is fairly well equipped to do this, it would be desirable to pool the basic ideas from different disciplines and put together systematically in some kind of a handbook, so that he is able to indicate the balance that exists in nature and any attempt to disturb this balance is detrimental to the man himself".

CHAIRMAN : "The subject before us at the moment is, in fact, Prof. Balezin's paper about Chemistry. The question of incorporating nature conservation concepts in the Geography curriculum is an additional item. Further discussion on this subject could, perhaps, take place in the general discussion later. Comments by Dr. Pritchard on Dr. Balezin's paper are useful, but what he has said is, in reality, the field of research. In the school education, the extent and the form of research at that level will depend upon the individual teacher's interest."

Mr. P. V. RAJAMANNAR (India) suggested the following points for consideration :—

- (1) The recommendations should be drafted after further discussion by separate working groups.
- (2) The conservation principles should be incorporated into the existing Physics, Chemistry and Biology curricula.
- (3) Good and cheap supplementary readers should be prepared for schools."

Dr. S. DORAISWAMI (India) : "I want to clarify certain points and remove certain misconceptions raised by Mr. Rajamannar. Firstly, it is not correct to say that the NCERT is changing its policy of curriculum so rapidly that we do not know where we are. I would like to repeat that NCERT has no mandatory power it is only an advisory body. The real exercise they had in curriculum making was in connection with the project for Improvement of Science Teaching. Curriculum

making is a continuous process, and it should not surprise anyone if the curriculum is changed as a result of our experience and feed back from active teachers. The syllabus framed by the NCERT was framed long before we had heard about the IUCN. The analysis in my paper was only to highlight the topics on conservation within the syllabus. It has other aspects but it is essentially a BIOLOGY syllabus.

Regarding Teacher Training Programmes, what is envisaged is Summer Schools where Teachers could be trained on a framework of syllabus drawn up by experts. These schools should not be compared, much less confused, with the Summer Institutes which, according to Mr. Rajamannar, have not had impact at the student level. The mistake, perhaps, is in the mechanism of the working of these institutes where books on biology are used which were prepared for another country and had no direct relationship to the class-room material in this country. There are other types of Summer Institutes or Schools run by the NCERT which are geared to the class materials prepared by them, and the teachers who have gone through such Institutes have expressed their view that they are benefitted.

I suggest that this problem in school teaching should be tackled at the following stages:—

1. Curriculum or syllabus construction which includes several aspects of conservation education as have been pointed out.
2. In the class-room, what should be aimed is the creation of an awareness in the pupils to the facts of conservation.
3. Teacher Training Programmes following a prepared framework including conservation topics.
4. Out-of-school activities, like starting of Young Naturalist Societies, which could undertake excursions and summer camps under guidance of teachers where conservation topics are widely used.

The pupils of today will be citizens of tomorrow, and some of them may become administrators who decide on policies affecting conservation and pollution."

PROF. R. G. MILLER (U.S.A.) : "I hope that even though we try to infuse it into all other courses you will not dismiss trying conservation as a separate course of study.

On Chemistry, I wish to say that a conservationist can see the problem in these terms. I know that one whole college course starts with "Conservation of Energy" as one of the first laws of chemistry. And the biological approaches to the subject show that the whole basis of energy conversion and use has in that thin skin of Photosynthetic tissue of the world's plant cover. Children should be told that there is no substitute for this and that it needs to be protected. When forest cover is removed, another chlorophyll layer must be established. All life depends on this chain of energy which first is captured from the sun by plants. This is the base of agricultural economy and of consumers everywhere.

Chemistry is the basis of the industrial society as well. Now in the United States we know that American cigarettes are bad for Americans. When something is unmarketable or outlawed at home then it is exported. Also ruled out at home, D.D.T. will be exported. Now the U.S.S.R. and U.S.A. have signed a Non-proliferation (of atomic weaponry) Treaty. This requires sharing the peaceful uses with all countries. This is dangerous and it should be the concern

of conservation that these peaceful uses are not entered into in our present ignorance. This is a world problem, as is the burn off of oil well gases which give off CO₂ into the atmosphere. This disposal of unmarketable hydrocarbon contributes to the deficit of oxygen in the earth's atmosphere beyond what can be readily reconverted to usable oxygen at the rates possible in the ecosystem (this is an opinion but we know nothing better).

These are not the problems of any one country only.

Everything you have said here during these two days about education in India is true also of America—and every other country.

I hope that from this meeting at Dehra Dun can come a statement about our concern for environmental education on a world-wide basis, recognizing that we share this environment across all borders and that the problems of quality and sufficiency are indeed international."

CHAIRMAN : "If we go into greater details of the scope of conservation and the various aspects of the problem, we would be digressing from the real purpose of this meeting. There was a suggestion from Mr. Rajamannar that the concept of conservation should be exactly defined. This is already quite well defined. If a more precise definition is required to suit our limitations, the same can be evolved by further group discussions in the country. In this small meeting, and within the short time at our disposal, it is not possible to touch all the aspects in great detail. For the same reason, it would be desirable for this meeting to make some sort of recommendations which can be followed up by a bigger group discussion, ultimately on regional or national basis. It is necessary to confine ourselves to broader aspects and not the finer details in our present discussion."

MR. P. D. STRACEY (India): "There seem to be both psychological and economic barriers in the spread of conservation education and knowledge, as revealed from the papers and discussions, i.e., failure of teachers and others to take interest in the programmes offered and the fact that the only significant movement has been coming from a particular type of school, which is free from economic handicaps, i.e., the Public School.

Therefore, we must take cognisance of these barriers.

The efforts so far have been voluntary and extra-curricular in nature : should we therefore aim at compulsion and inducements of a practical nature ?

Should we consider a strong central organisation, such as a "Central Board of Environmental or Nature Conservation"?

Efforts at conservation education should be nationally planned and directed, so as to have the maximum effort on all levels of the Society."

DR. J. CEROVSKY (IUCN headquarters, Switzerland): "The IUCN is organising its 10th General Assembly and 11th Technical Meeting this year in India. Conservation Education on a world-wide level will be discussed at the "Education Workshop" on "The Problem of Conservation Education among the Population of Rural and Woodland Areas" which is to be held at the morning session of the 11th Technical Meeting on the 28th November.

The IUCN decided, no doubt in agreement with the Indian authorities, that there should be organised a pre-Assembly programme devoted to the study of special conservation problems in India. Our meeting is the pre-Assembly programme of the IUCN Commission on Education. In all materials about it, sent off from the Headquarters in Morges there has been always indication "Working Meeting in Dehra Dun on the Problem of Environmental Conservation Education in India".

PROF. ARTURO EIGHLER (Venezuela) suggested the use of two methods of environmental teaching :

- (i) the "integration" method, at the lower educational level;
- (ii) the "separate course" or "special assignment" in conservation, at higher educational levels.

CHAIRMAN : "The position is that the basic background information in the primary and the lower middle stages, ultimately converges into nature conservation concept ; and this is all that can possibly be given to the children. The material can be given in a little more elaborate manner at the Higher Secondary stage when the education takes a very distinct shape. It is this approach which, as far as I know, has been followed in the United States, where the basic items of conservation are synthesised into science curricula upto about middle level. At the Higher Secondary level, or the end of school stage, further information is given in Economics, Geography, etc., to focus the attention on conservation aspects. Because, at the apex in the University Education, the number of the pupils is much smaller, the conservation concept has, of necessity, to come after certain basic information has been ingrained in the minds of children, at the Middle School level and then at the Higher Secondary School level. It can probably form part of Economic Geography, because it is in this subject of Geography that the pupils study climate, distribution of plants and animals, crops, soils, geology and build up economic and environmental approach. Dr. Eichler's observation, that conservation education should not be so dissipated as to fail to divert our attention, is important. But there is another important question : would it be desirable to load the school children with another subject in the name of nature conservation and if the matter is capable of being concentrated in one particular subject ? The conclusion of all this discussion is that nature conservation has a foundation and that foundation does not lie in Biology alone. These foundations have to be built up, in a general way in the Primary and the Middle stages to the extent that the children can grasp, and then the whole thing is to be synthesised in one subject to focus attention on conservation."

DR. J. CEROVSKY (IUCN headquarters, Switzerland) : "In New Delhi, a report on the Working Meeting in Dehra Dun shall be presented. I hope the recommendations will be enclosed in this paper for the 11th Technical Meeting of IUCN in full wording."

The Chairman then called upon Prof. P. V. Bole to present Mr. Zafar Futehally's paper on "Nature Education in India".

Nature Education in India—(Mr. Zafar Futehally)

PROF. P. V. BOLE reported the salient points of Mr. Futehally's paper as follows :

"The Bombay Natural History Society—with the help of Nature Education Officer—whose office is financially supported by the Government of Maharashtra—runs a Nature Education course

with the object of creating interest in nature among children and teachers with the help of exhibits of Natural History Section of Prince of Wales Museum, which has a fine collection of animals and birds. Parties of children are taken round the museums, and they are told the basic facts about our commoner birds, mammals and reptiles.

From time to time, there are outings organised for children and teachers, accompanied by professors and experts in the field of Botany, Zoology, Geology and Geography.

The Society has published a number of pamphlets—"Glimpses of Nature" for Schools.

During these outings attempts are made to collect specimens of plants and animals and learn the basic principles of bio-geography and general biological principles of bio-taxonomy.

Talks and films are often organised for school and college students with the association of organisations such as Friends of the Trees, Cactus Society and Orchid Club."

Summary of Discussion

CHAIRMAN : "Prof. Bole has pointed out that the facility which the Society provides for training the teachers is not so fully utilised as it could be or as it should be. If the reasons are analysed and taken care of, I am quite sure that larger and larger groups will take the advantage. Just as in case of Summer Seminars organised by the NCERT, there must be limitations in respect of numbers and periods during which the teachers can participate. One solution to my mind is to organise mobile courses, like mobile dispensaries and mobile Family Planning Units, to be held in different centres of concentration of schools, so that the teachers who are responsible for teaching various aspects of nature conservation can take advantage of the classes. These mobile courses can be given outside the normal working hours, say, as evening classes, or probably the school organisations could give a concession by allowing them a couple of hours off from the schools. This seems to be the only way to train our large mass of teachers from the rural areas, otherwise it would be a long drawn process."

DR. S. DORAISWAMI (India) : "Regarding the lack of enthusiasm of schools to take advantage of the activities arranged by the Bombay Natural History Society, I may point out that we had such difficulty in our monthly meetings involving Science teachers of our experimental schools. The School Principals are very reluctant to disturb the time-table of their schools and spare the teachers. The teachers also ask to know the gains for themselves by attending these training programmes.

Regarding the books and pamphlets prepared by the Bombay Natural History Society not being sold, I would like to emphasise that it is not enough to produce good books and increase their number. We must suggest methods how these books are to be used and hence teacher training becomes important."

PROF. R. MISRA (India) : "The Bombay Natural History Society has set an example for other societies to follow, in the education on 'Nature Conservation'.

The philosophy of conservation based on the conservation of human species and his values on this planet, as long as possible, should be brought home to the students and the teachers. They must be educated that without the conservation of the environment, man's life will ever

remain endangered. Perhaps this short of introduction to education at any level, and in any discipline, shall enthuse persons to receive it. We have to fight the callousness of the people towards conservation education."

DR. K. KRISHNAMURTHY (India) : "I have a few general remarks to make. It must be emphasized on the pupils and students right from the early stages of school education that man is an integral part of nature and he has to be taught ecological hygiene. This will enable him to preserve his environment and consume the natural resources for his own benefit and for the benefit of posterity. The large scale degeneration in the Nilgiris for potato cultivation, and the cutting down of wooded areas for human habitation as in Bangalore and other areas, are problems that a developing country like India is facing. As Dr. Pritchard stressed yesterday, we should learn from the mistakes committed by developed countries and we have to devise means and ways so that we do not repeat the same mistakes in our hurry of industrialisation. It will be worthwhile to investigate if the vagaries of monsoon and the climatic changes over the recent years in our country, have anything to do with our irrational exploitation of natural resources and failure to conserve nature."

PROF. P. V. BOLE (India) : "The past experience shows limited response from schools of which the causes may be studied. The pamphlets, "Glimpses of Nature", are being revised and reprinted after about 15 years. It is suggested that this effort may be extended to rural areas also."

CHAIRMAN : "The question of the number of people getting interested in nature and nature conservation is essentially a social problem. Like any subject, there will be some people who will be interested in conservation aspects, some will be just casually interested, and yet others will be indifferent or even opposed. Gradually and progressively increasing number of teachers will be enthused into nature conservation, thus building up a congenial atmosphere. Even in the practice of soil and water conservation, local societies in villages are only gradually attracted to it. So in the schools also, the indifference towards this type of training courses is a part of the social problem. The answer, as far as school education is concerned, lies in a definite and a positive action by the authorities responsible to build up active interest in those who are to impart the education. So both things have to come together. Merely calling upon the teachers to take the training and asking for the text-books to be prepared by some central agency, though may be useful but will not achieve the objective. The administration responsible for school education should take an objective approach and action in this direction."

DR. TOM PRITCHARD (IUCN, U. K.): "Experience is showing that the use of the environment as an educational 'tool' involving, inevitably, field studies, is an approach of fundamental importance in creating an awareness of conservation. Curricula development projects in some parts of the world are paying attention to the scope in this approach. Some imaginative schools have accepted for 6-11 year age-groups (primary), to educate their pupils entirely through the medium of environment; even the teaching of mathematics has successfully been pursued in this way. It seems to me that it is very important to consider this approach in India where suitable environments are available for field studies for a large proportion of the school children.

In some parts of the world, history can also be taught in a much more exciting fashion if it includes local field studies. Pursuit of natural history and education, over and above the

response to environment and use of environmental issues as educational material, would be an added bonus for those who are inclined towards such activities."

DR. T. SZCZESNY (Poland): "In the papers presented by Prof. Balezin and Mr. Futehally there are common points. For our discussion, there are some specially important ideas, which Prof. Balezin has put in the last sentence of his paper in which he says that "It is only through combined efforts of the engineers, scientists and statesmen of the earth, that the impending destruction of the natural wealth of our beautiful planet could be thwarted". Prof. Balezin has spoken of the most important task, that of inclusion of the problems of the conservation of nature in the curricula of the schools of all the standards, including perhaps the high school (colleges).

Mr. Futehally says that in India the achievement of this task relating to the inclusion of the principles of conservation of nature in the syllabus is very difficult, and that at the moment there is hardly any teaching on conservation in progress in India. It must be indicated that such type of deficiency exists to a great extent in other countries also. I should like to emphasize that the choice of the forum and the measures to be taken for realising these in India must be finalized after imparting an acquaintance with the conditions obtaining in the country. How can one solve this problem, depends firstly on the suggestion of those of our Indian friends who know best the conditions existing in the country."

DR. G. BUDOWSKI (UNESCO, Paris): "I feel compelled to comment on what has just been said namely that it is up to Indians to solve their educational problems. However, it is equally obvious that the importance of such problems trespasses the boundaries of this country ; indeed they are world-wide problems. This is certainly the way UNESCO considers India's environmental education particularly in view of finding ways to strengthen it through appropriate action. It is in this context that the inter-governmental, inter-disciplinary, long-term programme on Man and the Biosphere, resulting from the Inter-governmental Conference of experts on the scientific basis for rational use and conservation of the resources of the biosphere (Paris, September, 1968), is being conceived.

Some of the projects which have been suggested for the programme will indeed incorporate many of the suggestions you have made. But to be effective, it is absolutely necessary that the best understanding of your structures and difficulties is conveyed to those co-ordinating international action. In this context I am particularly grateful for the frankness with which you have spoken around this table.

At any rate I want to make it clear that your problems are world problems and they are of course, also those of my own organisation."

The Chairman before requesting Mr. P.D. Stracey to present his paper suggested the names of Prof. R. G. Miller, Prof. P. V. Bole, Prof. P.V. Rajamannar and Prof. R.Misra to form a committee to formulate recommendations on University Education.

Some suggestions for promoting Education in Nature Conservation in India—(Mr. P. D. Stracey)

MR. P. D. STRACEY introduced his paper with these remarks:

"Considerations for propagating nature conservation ideas must take cognisance of the general level of literacy and of education, which, as we know, is very low in India. This

points out to the importance of audio-visual types of education, propaganda and publicity. However, literary type of education for the educated cannot be neglected.

In India, there is, at present, deplorable scarcity of educational and projection material, and suitable literature on the subject. Organisations for the spread of message of wild life and nature conservation are only a few. Attention should be focussed on audio-visual aids suitable for the masses and for the literate. Production of suitable wall atlases, maps, charts of different kinds, simply written books in regional languages, with illustrations, projection material for model lectures and talks, and games based on wild life with the necessary slant of conservation will go a long way in the achievement of our objective.

Methods of conservation education should be largely directed at the young. School curricula should devote a part of the time to nature and wild life education. Ways and means should be found to produce literature on wild life, in a much larger measure, and the opportunities afforded by zoos and natural history museums should be fully availed of for mass education."

Summary of Discussion

DR. G. BUDOWSKI (UNESCO, Paris): "In relation to the paper presented by Mr. P.D. Stracey, I would like to stress that his suggestions follow very closely those of the working groups that met last month in Paris to advise on the scope of the inter-governmental programme on 'Man and the Biosphere'.

Therefore the plea for specific recommendations on these matters will strengthen the proposed programme."

DR. HERBERT S. ZIM (U.S.A.) : "Educations tend to move directly towards books especially text-books on the technique to use. Audio-visual aids come next. Recently much attention has been given to the role of educational games or a learning device in which the student plays an active role.

Mr. Stracey's conservation game may have been developed ahead of the times, but it is very pertinent now. In the development of materials for conservation education in India—at all levels—games can play an important part."

DR. J. P. DOETS (Netherlands) : "IUCN works in two ways :

- (a) Supports Societies
- (b) Supports Governments

It is glad to render service.

The IUCN Commission on Education will gladly render services in promoting TV programmes in view of the expected Satellite TV beaming all over India."

CHAIRMAN : "The most important point that emerges out of the paper is that there should be a properly financed organisation for preparing the teaching aids on a mass scale and making these available to various schools and educational institutions. This naturally has to be backed either by the Government of India or by the State Governments or by some regularly organised societies such as Bombay Natural History Society or the Wild Life Preservation Society. Should it be the responsibility of the Education Ministry or it should remain the responsibility

of the privately organised societies? Here we are considering the question of international collaboration in this type of job. IUCN is an organisation which can perhaps help the private societies in this work."

The Chairman then requested Prof. P. V. Rajamannar to present his paper.

University Education and Training in Nature Conservation in India—(Pr f. P. V. Rajamannar)

PROF. P. V. RAJAMANNAR introduced his paper with a gist of his ideas on academic problems involved in training for conservation programmes.

"Science Courses should be so designed as to train the students to identify and investigate the phenomena of the environment with a keen sense of perception and inquisitiveness. They should be taught to analyse their observations, e.g., behaviour of birds and animals, phenomenon of variation in temperature, vegetation etc. in different zones, from a critical angle. Training for a biologist should aim at the development of an attitude of investigation inside class-room and outside with a view not only to add new knowledge but also to reform and refine existing knowledge.

Preservation of Wild Life is only one aspect of conservation. College and University courses should demonstrate the checks and balances that operate in various ecosystems, and suitable laboratory and field exercises can be designed for illustration. Experiments can be designed in the laboratories to investigate the effect of releasing polluting agents in the environment, e.g., the effect of smoke, etc., on the photosynthetic activity of the plants.

We can educate our students in the basic concepts of nature conservation by re-designing existing courses and laboratory exercises in Biology, Geology, Chemistry and Physics, without altering their basic structure. Tackling the problem of conservation through education of the citizens will be far more effective than Governmental efforts through various agencies.

There is an urgent need for greater co-operation in drawing up of syllabi and co-ordination of instruction between Botany and Zoology Departments, in such areas like Ecology. It would be profitable to give a regional flavour to biology education.

Universities can be assigned the basic research problems relating to conservation, if they have the necessary facilities and expertise.

The creation of departments of Nature Conservation at State level will provide incentives for students to offer these courses and bring about liaison between universities and Government agencies."

Summary of Discussion

PROF. R. MISRA (India) : "Leadership in conservation education has to flow from the Universities. Hence University level education assumes special importance.

The science of conservation is Ecology in its broadest sense.

Education and research go together at the University level. Researches in Ecology although started in the Forest Research Institute could not take roots in India till 1935. In 1930,

three Indians started teaching the subject at University level. This teaching was based on researches done in India and books and papers produced within the country. Now more than 50 Ph.Ds in the subject are spread all over India.

The ecosystem approach and systems analysis approach are necessary for the management of any ecosystem.

The International Biological Programme (IBP) and now the Man and the Biosphere Programme (MBP) are giving impetus to conservation ecology in the Universities. Scientists must be granted freedom to move about in different countries for the pursuit of knowledge."

CHAIRMAN: "The practice of conservation is essentially a part of the usage of the resources, and an application of science and technology. This has to be a part of all professions and technologies which use the environment. In the University level of education, the science of ecology undoubtedly forms the foundation of a comprehensive concept of conservation. However, this concept has to be woven in to the respective subjects of Zoology, Botany, Forestry, etc. A student has to grasp the concept of renewability of natural resources and for that ecology is a veritable tool in his hand. Similarly, an engineer while constructing a road has to bear in mind that his road construction programme should be so planned that it does not cause soil erosion and other such damages. So conservation has to be an all-permeating concept and an all-permeating movement, covering all types of land use. It is actually a way of living. Conservation is essentially an applied concept; it is not an abstract concept. How and in which discipline the conservation education should develop, is a question to be looked into.

Unfortunately the collection of basic data is often viewed as unproductive research, and in any case not of any immediate use. This is why research in conservation, both at the University level and in the applied field, is not receiving as much attention as it should. In this respect, I endorse the views of prof. Misra. Research in this field has to be given greater attention.

Regarding the idea of having Conservation as a separate subject at the University level, I feel it is not practicable, as the specialisation in the subject will create an artificial aloofness from the related disciplines such as Agriculture, Forestry, Geology, wherein conservation principles are widely applied. I would submit that conservation should form a part of general education system and included in subjects like Botany, Zoology, Geography and even in Economics as part of Humanities. This is how the awareness can be created, among the mass of people, for the conservation of resources and environment, which we should not take for granted."

DR. J. CEROVSKY (I.U.C.N. headquarters, Switzerland): "Conservation started as voluntary and private movement, and turned into a system of practical measures and activities. This sometimes proved to be as not effective enough, because of lack of authority, power and education—and also lack of scientific basis.

In this stage of development we need a firm, serious scientific basis for conservation—the science on nature conservation. First attempts are being made to define the principles, terms and methodology of this new science. I would like to draw your attention to a recent paper of Dr. L. K. Shaposhnikov in the last but one issue of the International Quarterly "Biological Conservation". The term "Sosiocology" was suggested for the new science.

At University level, where training in sciences is provided, this new science should be taught as a separate special course not only for the specialists but also other future professionals involved in natural resource use, such as foresters, agriculturists, etc.

A very characteristic feature of the new science is its inter-disciplinary position. Both natural and social aspects must be included."

DR. J. P. DOETS (Netherlands): "Multi-disciplinary and multi-departmental approach has become the new trend in counter attacking the threats to our environment.

Close co-operation with those bodies and organizations, which are responsible for the care of *homo sapiens*, bred animals and plants as for the wild flora and wild fauna, is evidently called for.

Geography provides the basic knowledge for landscape planning, and the IUCN's Commission on Landscape Planning will gladly render its services to India."

Forestry Education—Primo Genitor of Nature Conservation Concept—(Mr. R. C. Kaushik)

MR. R. C. KAUSHIK (India), Chairman, introduced his paper with the following remarks :

"Originally I thought that I would write a paper titled "Nature Conservation in Forestry Education Curricula", but when I got down to it and had a review of the forestry curricula all over the world, including India, it immediately dawned on me that forestry education was fundamentally in itself a nature conservation education. As early as in 1760 the German and French foresters had observed and recorded the variation in vegetation and soil, and correlated vegetation with soil and climatic factors. Sometime in early 19th century, growth was correlated with the environmental factors and the theory of tolerances of species in relation to temperature, light, moisture, etc., thus formed the foundation of silviculture. In 1852, a complete treatise was written on the subject by a German forester, Heyer.

It is interesting that by the time the science of ecology was defined by Haeckel in 1886, the forestry profession had already a systematically compiled data for over a century. It was not an empirically compiled data; instrumentation had been used to determine the actual nature of forest influences, and this was much before the concept of ecology came into vogue. Incidentally, the term "Forest Conservancy" is being used right from about 1730, when formal forest education started. So the term 'Conservation' has actually originated from the Forestry science itself, and that is why I have titled this paper as "Forestry Education—Primo Genitor of Nature Conservation Concept".

Today, forestry may not be the only source of nature conservation ideas, but one thing is certain that the forestry curricula all the world over are quite comprehensive from the point of forest conservation. The whole concept is based on maintaining the *site*, as we call it, under a complete canopy of trees and other vegetation and correlating growth with the factors of locality. Our harvesting process aims at the removal of the crop in a manner that the renewability of the forest resources is maintained. So forestry science and its practice are based entirely on nature conservation principles, and are basic in the application of economics to forestry, because Forest Management is nothing but Economics applied to Silviculture. Forestry education even today is playing an important role in the advancement of nature conservation; the *related sciences* of Soil and Water Conservation and Wild Life Management have also come up as offshoots of forestry curricula.

In the U.K., for example, where some of the universities running forestry courses do not get sufficient number of students, with some modifications and additions these courses have been converted into natural resource conservation courses. This is how forestry education is contributing to nature conservation ; this is the general theme of my paper."

The paper was thrown open to discussion. After a few remarks by some of the delegates, the Chairman again took the floor to substantiate the substance of his paper with some further remarks.

CHAIRMAN : "I firmly believe that no single profession can claim to have the monopoly of conservation education. It has to be infiltrated into all the professions, particularly those dealing with land use, which is the sum total of what we want to conserve. So Agriculture and Forestry are the two professions which are using major part of the land resources. In addition to Forestry and Agriculture, conservation education has to travel to civil engineers and architects also, so that in their road development and urban projects they bear in mind as to how best to maintain the landscape, greenery, bird and animal life in the surrounds. The irrigation and the hydro-electric engineers, of course, automatically have to get the soil and water conservation education, otherwise their dams will get silted up and their turbines corroded.

The main objective of this paper is to bring out that forestry education is a very comprehensive nature conservation education".

CLOSING REMARKS

The Chairman then requested Dr. J. Cerovsky to give his closing remarks before taking up the final resolutions.

DR. J. CEROVSKY (IUCN headquarters, Switzerland): "On behalf of the IUCN Commission on Education, I convey our warmest thanks to the organisers of this conference, the Forest Research Institute, and its President, Mr. R. C. Kaushik, for his very active participation, and all the participants who took part in our meeting and discussions. It was a pleasure for us to meet some of the local teachers here in Dehra Dun, and those people who are working in the field and are implementing conservation education programme. I would like to thank very much the experts from UNESCO, working on the Science Teaching Project in New Delhi, for their very active participation in the preparation of the meeting and for coming here. I think this is a wonderful pattern of concrete co-operation between UNESCO and IUCN on this subject of environmental conservation. It was indeed very nice to have their active co-operation.

The discussions at the meeting have created a platform and a nucleus to form a basis for some concrete actions. On behalf of IUCN, I assure you of the continued co-operation. We have learnt about your problems and about your approach and are impressed by your papers and contribution to the discussions. We think it is really a wonderful example for other countries, and it would be very good if we could rely in future also on your assistance to the educational work by IUCN.

I am impressed to hear about the experience and the activities of the voluntary organisations in the environmental conservation education. One of the features that we realised here is that the problems of environmental conservation education are of similar type and character all over the world. The first work in many countries, in this direction, was started by voluntary

and private organisations. It was done as an extra curricular and out-of-school education programme, before these principles of environmental conservation education were included in the school curricula. We should not overlook this important out-of-school education, especially to the young people who get very enthusiastic about things through such means of education. Of course, at this meeting, the form of environmental education at the primary and secondary school levels is of special importance. What we are aiming at is no doubt an integrated approach. In the ideas and suggestions of Prof. Balezin, we saw one example of conservation education being infiltrated into the teaching of Chemistry. I was very much impressed by the remarks of Mr. B. S. Parakh that "nature conservation is a way of life, a philosophy which has a definite social component". It would be wonderful to get this philosophy into the teaching, not only of Chemistry (as some specialists are interested to introduce conservation into this subject), but of other subjects like Physics, Geography and others.

There are some other higher professional and university training courses where I would suggest the importance of introducing environmental sciences on "conservation" as a special course, giving an integrated survey and ideas on environment, ecological basis of management of natural resources, etc. Of course, teachers' training is very important. The question arises as to how far teachers can get interested in environmental education. They have to be trained in the modern approach to nature conservation.

I appreciate the interest being taken by the Indian specialists who have gathered here and are working on these programmes. This is a very good nucleus for developing environmental education in India, and I wish that this gives us the basis for the recommendations which we have now to make and accept.

Before I conclude I would just like to say that, for most of us, it was our first meeting and our first visit to this wonderful Forest Research Institute. Speaking on behalf of the participants and of IUCN, I hope this is not the last occasion of meeting you and visiting Dehra Dun."

The resolutions were then read and approved as given in Section II.

SECTION II — RESOLUTIONS

Committee on School Education

The Working Meeting of the Commission on Education of IUCN :

Considering the deterioration of human environments in India and the world as a result of disturbance of nature and depletion of the natural resources:

Recognising the urgent need for introducing an intensifying appropriate method of conservation education at all levels :

Considering that conservation education should become a part of the curriculum of all schools of the national system of education :

Being aware of the pressing need for an ecologically oriented method of education in the teaching of biology and other subjects :

Recommends to the Plenary Session of IUCN that National Authorities on Education, Educational Organisations and other similar bodies engaged in the revision of curricula and syllabi in all States:

1. Set up an Indian Committee of IUCN for Conservation Education to maintain the activities and the follow up in the States.
2. Take into consideration the importance of conservation education and include concepts of these topics into the syllabi in biology, physics, chemistry, geography, social sciences and other related disciplines.
3. To undertake research and prepare teaching aids including suitable text-books, teachers' guides and supplementary materials based on the syllabi as well as audio-visual aids like charts, film strips and films.
4. Implement the objective delineated above by inducing teaching in the classrooms to follow methods involving environmental studies so that an awareness of the role of nature is created in the pupil.
5. Train a core of teachers through short courses in conservation and environmental concepts to form the leaders in their respective areas and act as resource persons to train further batches of teachers.
6. Urge the appropriate bodies to develop a system of incentives for teachers participations in in-service courses of conservation education.
7. Organise workshops, seminars and other training activities for teachers who are responsible for environmental education.
8. Organise out-of-school activities through such organisations, as Young Naturalist Societies, which should be encouraged to undertake excursions and summer camps to study nature and nature conservation.

9. Set up a working group as Action Committee to guide workers on conservation education; this group would include representatives of university teachers, central educational organizations and State Departments of Education and representatives of voluntary organizations engaged in nature conservation activities.

10. Make full use of available assistance offered by inter-governmental and non-governmental organisations for those nature conservation education programmes that would gain in strength and scope through such action.

Committee on University Education

The quality of the human environment, and thus of human life, in India is threatened by the accelerating rate of depletion of natural resources on account of the population explosion, and the growing demand of material needs including pollution from industrial and other sources. The economic and social problems relating to the management of natural resources are particularly serious in India where indigenous industries and agrarian life make society very dependent upon the condition of the environment. Hence, it is most urgent for universities and other higher institutes to assure leadership in education, vocational training and research relevant to the wise use of natural resources of vegetation and animal life, and of soil, water and air upon which they depend.

The subject which is of central importance in this context is ecology which, hitherto, has been a component part of some botany, forestry, geography and zoology courses. However, an inter-disciplinary approach is now required in order to relate broadly-based ecological science to the needs of the nation with respect to the management of natural resources.

We, therefore, recommend to the Plenary Session of IUCN, that universities and other higher institutes, including the Forest Research Institute and Colleges in India :

1. Should establish inter-disciplinary courses of study and research to train students for vocations in the natural resources field, such as M. Sc. courses in environmental sciences, and natural resources;

2. Should provide facilities for more widespread dissemination of ecological knowledge in liberal studies for all students;

3. Should ensure that ecology and related environmental sciences form a part of the courses in the training of teachers ;

4. Should review their scope for initiating research into ecological problems which have a direct relevance to serious environmental issues ;

5. Should encourage greater communication with each other and with institutes outside India, especially through the media of UN, UNESCO, FAO, IUCN, IBP and other governmental and non-governmental agencies ; and

6. Should institute chairs and fellowships at some selected centres and arrange for exchange of scholars.

SECTION III — REPORTS

Brief report on the visit to the Indian Forest College, Wild Life Club, Central School, New Forest and Doon School

(By DR. J. P. DOETS, Vice-Chairman, North-West Europe Committee,
Commission on Education, IUCN)

During the Working Meeting of the Commission on Education, IUCN, held at Dehra Dun, 21st-22nd November, 1969, a visit to three schools was arranged for the participants of this meeting.

Two of the schools visited were situated on the campus of the Forest Research Institute. Needless to say, that this situation offers a maximum of possibilities to envisage an education, which can make full use of the environment as a didactical aid. That this situation also stimulates the pedagogical climate in general is also evident.

The premises we visited proved to be of a modern structure—nicely and efficiently spotted in the parkyard of the Institute with sufficient space between the buildings, without however creating an "internal" isolation. Therefore the group-feeling could be maintained.

Except the drawing room—which during the visit was a bit crowded, which could probably do with more inter-space between the pupils so that the creational expression—in itself a valuable pedagogical situation—could profit from a more individual situation.

The shown, and partly demonstrated, teaching aids proved to be of a modern design and were, as far could be noticed, and wisely used. The use of modern film equipment, which can create, if used regularly and at the proper moment, a favourable pedagogical situation.

It was clear to the visitors, that with the above mentioned situation of these schools on the campus, the Indian Forest College as well as the Central School, New Forest can profit highly from the available know-how, invested in the Forest Research Institute, where the source of applied conservation-sciences is so close at hand.

The combination of the schools together with the institute with its highly skilled personnel and the so extremely important instructional gardens on the same area, gives the Forest Research Institute an unique opportunity to establish on its premises and field centre, where classes from neighbouring schools could be actively engaged in fieldwork together with their teachers under the guidance of well-trained ecologists, a better opportunity can hardly be found.

In the city of Dehra Dun, we visited also the 'Doon School'—a public school, housed in the original buildings of the Forest Research Institute. The teaching aids, as far as the participants were able to see, proved to be of an excellent standard. The attention given to the promotion of free-expression in a cultural setting was clearly visible in the exhibited results.

The sports-facilities we saw, were good. The team spirit is materialised on the walls of the building, showing the results of the games played.

All in all, the schools we were able to visit showed a high potential of possibilities, more in particular with regard to the favourable situation to use the environment as a educational aid.

SECTION IV — APPENDICES

APPENDIX I

List of Delegates

List of Delegates participating in Education Working Committee Meeting of IUCN on 21st & 22nd November, 1969 at the F.R.I. and Colleges, Dehra Dun.

1. Mr. R.C. Kaushik, President,
F. R. I. & Colleges, Dehra Dun.
2. Mr. H.C. Day, Dean,
Indian Forest College, Dehra Dun.
3. Prof. R. Misra,
Department of Botany,
Banaras Hindu University, Varanasi.
4. Dr. S. Doraiswami, Reader,
Department of Science Education,
National Institute of Education (NCERT),
NIE Campus, Hauz Khas, Sri Aurobindo Marg, New Delhi-16.
5. Mr. B. S. Parakh, Reader,
Department of Science & Humanities,
National Institute of Education (NCERT),
NIE Campus, Hauz Khas, Sri Aurobindo Marg, New Delhi-16.
6. Dr. V. Kaul, Reader in Botany.
Jammu and Kashmir University, Srinagar.
7. Dr. K. Krishnamurthy,
GAS in Marine Biology, Porto Novo,
Annamalai University, Annamalainagar P. O.
8. Dr. R. Nagabhusanam, Reader in Zoology,
Marathwada University, Aurangabad.
9. Mr. P. D. Stracey, I. F. S. (Retd),
G-10, Nizamuddin West, New Delhi-13.
10. Dr. Vladimir Galushin,
UNESCO Expert in Biology at National Council of
Educational Research and Training, UNESCO House,
40-B, Lodi Estate, New Delhi-3.
11. Prof. S. A. Balezin, UNESCO Chief Technical Adviser,
Science Teaching, UNESCO House,
40-B, Lodi Estate, New Delhi-3.

12. Dr. Gerardo Budowski,
Natural Resources Research Division, UNESCO,
Place de Fontenoy, Paris 7e, France.
13. Dr. Jan Cerovsky, Vice-Chairman of Commission,
Education Executive Officer, IUCN,
1110, Morges, Switzerland.
14. Dr. Tom Pritchard, Vice-Chairman of Commission,
Deputy Director of the Nature Conservancy in Wales,
Penrhos Road, Bangor, Caernarvonshire, U. K.
15. Mr. Johannes Goudswaard, Ing., Secretary of Commission,
Jan Van Loonslaan 20A,
Rotterdam-3001, The Netherlands.
16. Dr. J.P. Doets, Vice-Chairman of Regional North-West Europe Committee,
Head of Nature and Landscape Conservation Department,
Ministry of Cultural Affairs, Recreation and Social Welfare, Steenvoordelaan
370, Ryswyk, The Netherlands.
17. Prof. Arturo Eichler, Member of Commission,
Chairman of the Regional Latin-American Committee
on Conservation Education,
University of Andes,
Apartado 256, Merida, Venezuela.
18. Mr. Jonathan Holliman, Member of Commission,
Chairman of Working Group on Education/Information,
International Youth Federation,
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APPENDIX II

Papers presented at the Meeting

ENVIRONMENTAL EDUCATION—AN URGENT CHALLENGE TO MANKIND

By

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1. Introduction

1.1. *The Need for Environmental Education*

1.1.1. In recent years the total deterioration of the human environment, and especially of its natural component, has become the most urgent challenge to mankind, becoming a question not only of its present and future economic, physical, mental and social welfare but also of its survival at all. This problem is clearly one of world-wide importance. The first necessary steps to make human society aware of the unpleasant situation and to start immediate improvements have been undertaken by UNESCO (Biosphere Conference, Paris, September 1968, preparation for MAB international programme "Man and Biosphere") and by UN (agreement on UN Conference on Human Environment in 1972). The main reason for holding the UN Conference has been expressed briefly but clearly: "because there is a world environment crisis" (UN last General Assembly, 3rd December, 1968). A better, wiser use of natural resources, landscape and the environment as a whole involves a basic change in man's relationship with nature. This is a matter of both practical and ideological approach. The modern "man's partnership with nature" has to be achieved through appropriate education emphasizing real ecological thinking. It has to reach the general public. "It's tragic that ecological understanding is not a prerequisite for policy-making" (Prof. Laumont C. Cole in "Canadian Audubon", 3015, Dec. 1968, p. 132). It is necessary "to influence the approach to the biological problems that surround us; every community has its difficulties with pollution, sewage disposal, the misuse of pesticides, neglect of parks, unnecessary deforestation and, of course, family planning" (Kenneth V. Thimann in "Bio-science", 18/12, Dec. 1968, p. 1101). The great challenge to mankind is an appeal for proper education.

1.1.2. In the same way in which the nature conservation movement began to make public opinion conscious of modern civilization's influence on mankind by the impact on its natural environment, conservation education has tried to find and to outline the principles and methods by which to create an up-to-date "man's partnership with nature". Since 1950, these educational activities have been co-ordinated on a wide international scale by the permanent Commission on Education of the IUCN (International Union for Conservation of Nature and Natural Resources). Therefore, because of our long experience, we would like to explain briefly our main thoughts about environmental education from the point of view of its international co-ordination.

2. What is "Environmental Education" ?

2.1. *Definition of Environmental Education*

U.I.I. There has been a lot of research carried out during this century on the problems of change in the human environment and on techniques for its design and management. So there is the knowledge available, but the application of it is inadequate and slow. There is still insufficient public awareness of the relationship between man and his environment, arising from inadequacies in our education systems. (Dr. T. Pritchard in "Biological Conservation", 1/1, 1968, p. 27).

2.1.2. *By "environmental education" we understand all kinds of education and information which aim at creating a wise approach by man to his (natural) environment in the sense of conservation, wise use and management.*

2.1.3. Although "ecological thinking" is the basic feature of this wise approach and, consequently, of environmental education, this education cannot be only a matter of science and especially of biology teaching. Environmental education, on the principles of modern conservation of nature and natural resources and landscape planning and management—including not only scientific but also broader cultural, economic, aesthetic and ethical aspects, is an essential part of general civic, moral and liberal education. It has to determine man's philosophy concerning his relationship to nature and landscape as well as his role in the society living in this nature and landscape and using them as the basic component of its whole environment. As practical instruction, it has to influence and even to form man's behaviour in the wise use of his environment, providing him with basic principles and rules for such behaviour. In view of the numerous dangers of environmental pollution and deterioration in our modern world, this philosophy and this code of behaviour are of equal importance to mental and physical health, being in fact also a component of it, because man himself is the most valuable and at the same time the most powerful resource of the biosphere.

2.2. *Concept and Function of Environmental Education*

2.2.1. A short concept of environmental education was compiled by the Education Commission of the UNESCO Biosphere Conference. It is presented in the following paragraph.

2.2.2. "(1) The critical problems of the biosphere urgently require the development of environmental education to form an attitude of man and his society towards the biosphere in the sense of wise rational use and conservation of the natural resources and the unity of the landscape.

(2) The basic principles of environmental education, interpreted according to possible levels and purposes, should be :

to maintain and wherever possible to enhance the economic and social capital of the biosphere;

to provide an integrated scientific approach to the planning, management and development of the environment as a unit in space and time;

to seek man's personal fulfilment in partnership with nature through and with natural forces; and

to develop a policy of trusteeship for posterity.

(3) Environmental education is required in different depths, according to the level of education being provided and the objectives being pursued, and should reach :

specialists in different occupations dealing with both biosphere management and education in order to fulfil effectively the principles set out above;

adults in order to guide children and young people, to develop criteria by which they can judge policies and practices affecting their environment and, generally, to enrich their lives; and

children and young people, as part of a scientific and liberal education, to enable them to enjoy the environment and use it wisely.

(4) All available media should be employed in an integrated as well as continuous and sustained programme of education and information about the environment. Each country should have a council, centre or similar institution for environmental education and these activities should be co-ordinated also on an international scale."

2.2.3. The function of environmental education can be more readily seen and appreciated if consideration is given to the groups of people who will make an impact on the environment and who have to be educated and trained properly in the light of their role in society (quoted from Dr. Pritchard's article mentioned on page 2 of this report) :

(1) *First*, there are those who will embark on a career in the earth and life sciences, including biologists, geographers, geologists and agricultural and forest scientists, as well as farmers and foresters.

(2) *Secondly*, there are those who, as planners, landscape designers, architects, civil engineers and the like, will deal with the design, construction, and control of projects affecting the environment.

(3) *Thirdly*, these are those destined to become physicists, chemists and technologists, whose research and development work may severely affect the environment.

(4) *Fourthly*, there will be the future statesmen, public servants and other leaders who will—locally, nationally or internationally—formulate policies and authorize actions having far-reaching effects on the environment.

(5) The *fifth group*, and probably the most important in the long term, will be those who, as the educationalists of the future, will have the task of interpreting knowledge to young people.

(6) The *last group* includes those who, without any direct professional involvement, should have sufficient interest to form a collective voice which will influence those in the previous categories.

3. The System of Environmental Education

(Present situation, forms and levels, general important features, necessary requirements)

3.1. Environmental Education System

3.1.1. In order to be effective environmental education has to be carried out as a united (education) system, including both children and youth as well as adults, formal education at all

levels (pre-school, primary and secondary schools, high schools, colleges and universities, and post-graduate studies), out-of-school education and activities and public information, and all this system has to be well integrated within the general education system. Environmental education has not to be considered as a specialized matter of science education only, as it actually provides some quite important general educational benefit which will be pointed out in the following paragraph.

3.1.2. Environmental education at its present stage of development does not exist as an integrated, continuous and sustained programme. The elements of it occur particularly in science, especially biology teaching, and are developing at some universities (special chairs and institutes), within the activities of some youth and adult voluntary organizations, and through some mass media. In general, however, there is a lack of proper integration.

[3.1.3. However important it is to have an integrated environmental education system, there exist some items of it which deserve the highest priority. This should be given to teachers' and other educators' training, both initial and in-service, to the role of ecology and creative conservation in the university training of engineers and other technologists, the land-linked professions, economists and politicians, and to the out-of-school education and activities of children and youth.]

3.2. *Pre-School Level*

3.2.1. From his earliest days the young child has to make acquaintance with his environment, with other living organisms, earth, water, air, weather etc., and to learn how to enjoy and protect them. Education, through the parents and through the increasingly important role of the kindergarten, has to form a sensitive approach to the environment, its beauties and man's place in it. Also the role of picture-magazines and TV should not be neglected.

3.2.2. More studies on child psychology, mental development and the best educational methods are still needed. The effect of education at this age depends in the first place on the education of parents and on the training of creche and kindergarten staff.

3.3. *Primary and Secondary Schools*

3.3.1. The main "environmental subject" at primary and secondary school levels is natural history or biology. In many countries environmental and conservation education at this level is considered one of the principal educational tasks of science and especially biology teaching. The approach and space given to environmental education in school curricula and text-books, however usually do not correspond to the importance attached to it and still less to the actual needs. Some curricula and text-books keep to the old systematic pattern overloaded with morphology and description of classes, families, genera and species, while others try to be up-to-date by emphasizing genetics and molecular biology. Generally, they neglect ecology although it is the principal vehicle for environmental education.

3.3.2. There is an urgent need to revise the school curricula and text-books in science and especially biology teaching. Environmental education should be penetrating all this teaching, illustrating by examples the applicability of science to the improvement of man's life and through this approach at the same time giving a sound appreciation of science and a better understanding of its principles.

3.3.3. In view of the broad inter-disciplinary character of environmental studies, environmental education can embrace not only simple biology and earth science but also chemistry and physics, mathematics, history, art and literature. In many countries a quite good unity of approach is imaginatively taught at the primary school level. It appears much more difficult to maintain it at the secondary school level, where even biology frequently becomes separated into more specialized compartments. One of the principal necessary features of the united approach must be a concentration on overcoming the existing discrepancy between science and technology, between "naturalists" and "engineers". Not only technology with its modern concerns, but also biology and especially the ecological aspect discovering the life cycles and chains of events and changes within the ecosystems, is a real adventure of discovery. Both of them today have an important role in the design and management of the natural environment and in aiming at the final goal of a harmonious, well-balanced and wisely used landscape; and to this end they must co-operate.

3.3.4. Besides new text-books, fully respecting and including the principles of environmental education, there is an urgent need for all kinds of other audio-visual teaching aids. Formal teaching in school has to be supported by the conducting of simple experiments, field excursions and observations and out-of-school educational activities (such as competitions, camps and expeditions).

3.3.5. The key personalities in environmental education at this level are the teachers. Therefore environmental education, and specially its methodology and didactics, must be included in teachers' training programmes as an obligatory course, a more general one for primary school teachers and secondary school teachers in non-science subjects and a more specialised one for secondary school teachers in biology and earth science. The course should contain also field observations, studies and practical conservation training. Weekend and summer sessions, workshops, special lectures and courses, excursions, field studies etc. in environmental education for teachers should be organized within their training.

3.4. *High School and University Teaching and Training*

3.4.1. There are quite a number of special technical high schools training engineer specialists of middle-rank qualification, such as agriculturalists, foresters, builders, geologists etc. Their training programme is split into specialized subjects which can hardly give them an overall views of or a correct approach to the environment as a unit or a proper respect for taking environmental problems and interactions into consideration. Therefore, sosieology has to be introduced as an obligatory subject in most schools of this type and level or at least given the utmost possible attention and care within other appropriate subjects.

3.4.2. During recent years environmental education has developed in some countries through the introduction of new courses, post-graduate study programmes, diplomas and degrees in environmental sciences, by introducing ecological thinking into other courses, at least by some lectures, seminars and excursions, and by establishing special university chairs and institutes. This development should be encouraged, emphasizing all the time the inter-disciplinary character of environmental education. There is still a strong need for suitable teaching and training techniques, text-books and audio-visual aids. Universities dealing with social sciences and public relations (adult education, out-of-school education, leisure-time use, journalism etc.) should develop research projects on the methodology of environmental education among the general public.

3.5. *Out-of-School Education of Youth*

3.5.1. In the dialogue between youth and adults more and more emphasis is being laid on the misguided approach of the past and present generations towards the environment (heavy criticism of pollution and deterioration of all kinds, protest-songs concerning this subject etc.). Young people request immediate action, are ready to act themselves and in many cases are taking the initiative. This should be encouraged and interest among the broader masses of youngsters stimulated through :

- (a) support to all existing youth clubs and societies specializing in environmental studies and activities (national and local young nature-friends, naturalists, scientists, biologists, farmers, hikers etc.) by funds and advice, and the establishment of new ones on similar patterns;
- (b) introducing environmental studies and activities in a proper way into the programmes of other youth organizations, such as boy scouts, girl guides, young tourists, hikers, mountain-climbers, students, working youth, Christian and other religious clubs, countryside inhabitants and Red Cross ;
- (c) giving proper publicity to environmental problems in youth journals, magazines and all other kind of literature, and in radio and TV programmes, using suitable mass media to organize these activities.

3.5.2. It is not difficult to awaken interest in environmental problems among the younger generation. It seems to be much more difficult to sustain this interest by providing funds and tasks for them to participate in. Young people ask to be involved in action which, while improving their knowledge, at the same time makes them useful in service for mankind. They themselves wish, even at their age, to be able to take over their share of the general responsibility for the human environment and not to be only instructed in a—what to them seems to be—rather abstract and theoretical way about the environment. This can be achieved through organizing studies, excursions, expeditions, camps, workshops and training seminars, work-camps like "conservation camps", assistance in afforestation and other landscape management and use, public relations campaigns, etc., not only at local and national, but also at international levels, because of the high attraction of international exchange and travel for young people. Environmental studies and activities must become a real adventure for young people.

3.5.3. This out-of-school education of youth is of great importance for the future destiny and even the present state of our environment. Its advantages can be expressed in three main points :

- (a) general education, i.e., establishment of correct attitudes towards the environment in the future generation ;
- (b) a search for and training of future advanced specialists in environmental studies and management of the environment;
- (c) immediate efforts in the improvement of the environment (working camps, conservation corps, youth research projects, information and propaganda campaigns).

Furthermore, in this component of education we also find some very important general educational features. These will be especially :

- (a) interesting and advantageous use of leisure by young people;
- (b) education for voluntary service (by the general public);
- (c) education for international understanding and for peace through international co-operation.

(DR. J. CEROVSKY : International Youth Co-operation in the Field of Nature Conservation. Paper presented at "Verein Naturschutzpark" European Conservation Conference, Stuttgart, May, 1969).

3.5.4. The out-of-school environmental education of youth deserves a high degree of priority. It enables young people to act personally, and it involves the enthusiastic young generation, not yet infected by older people's scepticism, the generation which will have to use and manage the environment wisely and at the same time enjoy it thoroughly.

3.6. *Out-of-School Education of Adults*

3.6.1. Out-of-school environmental education of adults is provided by voluntary organisations and foundations which in some countries seem to play quite an important role. They are organisations:

- (a) dealing with environmental studies and management as a whole;
- (b) concerned with some special component of environmental studies and management (fishing, forestry, game management, nature study, protection and conservation, planting trees, etc.);
- (c) paying some attention to the environment within broader activities (tourists, hikers, technologists, writers, journalists etc., this group including also numerous general bodies, such as trade unions, youth associations and even political parties).

All these educational activities and efforts are to be encouraged and developed.

3.6.2. A very broad and important field for environmental education has been opened up by the growing potential of the working man's leisure time which quite a lot of people try to spend out of doors. The many-sided problems of recreation are becoming very urgent and topical at the present time. It may be said that the modern member of human society, bored and tired both mentally and physically because of all the negative influence of the urban and industrial explosion, is seeking, through recreation, a new partnership with nature. This is quite a valuable coin, but as usual a two-sided one, one side being the newly awakened man's interest in and understanding of his natural environment, the other the negative impact of man, through recreational activities, on his natural environment, including large and even small protected territories, beautiful natural areas, mountains and sea-shores. Therefore environmental education has two main tasks and at the same time two stages in this context:

- (a) to prevent the damage caused to the environment by people through their often unconscious bad behaviour in the countryside during their recreation ;
- (b) to use the chance of people being in the countryside for recreation to strengthen their knowledge of and understanding of the natural environment and its needs.

All this education must be carried out in attractive and interesting ways, presenting to the general public the adventure of discovering knowledge, not annoying it by prohibitions and boring instructions.

3.7. Information

3.7.1. All accessible mass media, cultural and lecturing centres and organizations for adult education have to be used in a continuous and sustained programme of dissemination of information, knowledge and understanding concerning the environment. These efforts should be aimed at creating a powerful public opinion on environmental problems which should be one of the most important means of influencing all those who actually decide and act in the management of our environment.

4. The Need for International Co-operation

4.1. Environmental Education on an International Scale

4.1.1. It has become quite clear that the problems of the environment have to be solved not only on a national but also on a world-wide level, because the environment is a matter for the whole of mankind and does not know any frontiers. Environmental education is an international matter too; for this reason it must be co-ordinated internationally with much more intensive care than is usually given to international co-operation in other fields of education and science.

4.2. International Bodies for Environmental Education

4.2.1. There are many international organizations, centres, institutes, etc., which pay some attention to the problems, theory and practice of environmental education, usually from a certain point of view close to their main interest and task, as for example UNESCO, FAO, WHO, IBE, IUCN, IYF, ICC and Council of Europe. It is clear that the IUCN, through its permanent Commission on Education, has some very useful experience and a broad enough approach to these problems and their solution.

4.2.2. In order not to split all these activities and to use the achievements properly, a special international body should be set up to help develop all educational activities in the different countries. This urgent need has been expressed by recommendation 13 of the UNESCO Biosphere Conference, "Inter-Agency Co-ordination on Environmental Education" :

"The Conference,

Recommends that UNESCO explore urgently, in consultation with the United Nations, FAO, WHO, WMO, ILO, IUCN and ICSU, the means of serving, on a continuing basis, the following needs in environmental education :

1. Extending existing liaison arrangements;
2. Reviewing existing programmes and proposals;
3. Identifying the changing needs in education and specialist training, and establishing priorities for action;
4. Recommending the division of responsibilities among the organizations concerned with regard to programme activity;
5. Recommending areas of action and specific projects which should be the subject of joint action by two or more of the relevant organizations. These projects might include the provision of common services in the preparation and distribution of educational materials through the various channels already available to the organizations.

Further *recommends* that attention be given to appropriate administrative arrangements for such purposes, including possibly the constitution of a permanent inter-agency working group."

4.2.3. The suggested permanent inter-agency working group should especially:

- (a) work out a list of all bodies involved and interested in environmental education at international level and prepare a survey of past and present efforts in the field;
- (b) in co-operation with all these bodies and using their achievements, experience and activities, launch a full world-wide programme of environmental education in which all its special and general components would be well integrated;
- (c) on the basis of this survey and programme, start action and develop projects.

Special attention should be given to :

- (a) the scientific, social, philosophical and moral principles of environmental education (i. e., what to present and teach);
- (b) educational methods (i. e., how to present and teach);
- (c) assistance to all organizations, governments, authorities and educational institutions which need advice;
- (d) preparation and production of text-books and all kinds of audio-visual aids;
- (e) seeking funds for the development of these activities.

4.2.4. A small professional staff will be required to organize the activities and raise funds for the projects. The necessary support should be received in the first place from the UN and their agencies. The permanent inter-agency working group could be served by the education department of IUCN headquarters in close co-operation with UNESCO.

4.2.5. The international programme of environmental education should be included within the MAB (Man and Biosphere) programme of UNESCO. All suitable international campaigns (such as International Conservation Quinquennium, International Education Year and European Conservation Year) should be used to promote and to stimulate this educational programme.

CONSERVATION EDUCATION IN SCHOOLS IN INDIA

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Summary

The school education system in India has evolved a lot in the last two decades and nature-conservation now finds a proper emphasis at all stages. This paper presents the results of a critical survey conducted in representative schools in north-western India to study the extent and quality of nature conservation courses. The study has revealed that nature conservation courses of adequate breadth and depth have been introduced in the syllabi. Necessary text-books have been developed and prescribed. The need for audio-visual aids is well recognised but their availability is rather limited. The need to strengthen the rural teacher community responsible for nature conservation education is emphasised. Education Department could lean on the Forest Service who are the pioneers in conservation education in the country for the training of teachers in the rural areas.

Introduction

India is in the midst of a socio-economic revolution since last two decades to fulfil the aspirations and hopes of the people for prosperity and better living after two centuries of a static and subsistence living. The process of planned development of natural resources of a nation, to be successful, must maintain a scientific and technological approach ensuring a scientific climate, involving the largest possible section of population in the process. It is through such an approach alone that in developing countries the stages of progress can be telescoped in time to keep pace with advanced nations. Inadequate appreciation of the principles of nature conservation in this swift evolution can lead to disastrous results through wastage and irreparable damage. How basic is the need of weaving in adequate nature conservation education in the expanding education system of a developing economy is apparent. How far a nation appreciates this fundamental social necessity in preparing the common citizen to be able to appreciate the scientific limitations of his environments is automatically reflected in the general education system. The school education stage has a foundational role in this process.

Effective education in any new field has of necessity to proceed by stages. The basic task in the process is to prepare the teachers, determine the syllabi, evolve text-books, and other teaching aids which should become freely and easily available.

The school educational system in India has evolved a lot in last two decades after independence. Pre-university education which was traditionally of ten years duration now takes

eleven years, generally. Curricula, syllabi and teaching methods, upto middle standard are regulated by administrative action of the State Education Departments. In majority of States the transition from the middle to the higher secondary stage after eight years of schooling is regulated by a Statutory Board. The pre-university schooling stage culminating in matriculation or higher secondary examination is invariably regulated by a University or a comparable Education Board. On the whole all over the country the pattern of education has evolved more or less uniformly and today practically the entire children population has the opportunity of school education.

The present school education system provides a much more broad-based education than two decades ago. Not only the coverage of subjects is comprehensive but the teaching itself maintains a sustained high pressure. By and large very good text-books have been developed to match the system and audio-visual and other teaching aids are freely used.

As could be expected, nature conservation education now finds a proper emphasis at all the stages of schooling. It is built up in a scientific way so that a student completing higher secondary education has an opportunity to acquire a good understanding to be able to pursue and practice conservation concept living in harmony with nature, and to be able to appreciate the extension activities of the Government agencies as part of the development programmes.

This paper presents the results of a critical survey conducted in a few representative schools in north-western India in the States of Uttar Pradesh, Delhi, Haryana, Punjab, Himachal Pradesh and Jammu and Kashmir, covering about one-third of the total population of the country to study the extent and quality of nature conservation education in school curricula.

Method of study

A comprehensive questionnaire was prepared to collect the data. The contents of the questionnaire included : stages of education (primary, middle, high school/higher secondary) existing in each school, courses (both compulsory and "elective) offered by students at each of these stages, the names of the courses in which nature conservation is taught at each of these stages, the syllabi of the courses in which nature conservation is taught and outdoor and extra-curricular activities undertaken by the students at each of these stages as regards nature conservation studies. Besides getting a reply to the questionnaire approved syllabi in each of the courses were examined as also the various teaching records kept by the teachers. The teachers were also questioned on certain specific points regarding theory, practicals and outdoor activities of the students connected with nature conservation studies. A broad assessment of the motivation in thinking of the students was also made. The results of the study have been revealing, and are presented in the Statements I and II.

General pattern of school education

Though school education system in India is undergoing a change and varies slightly from State to State in the matter of details, broadly speaking, there are at present four different types of school education systems prevalent in the country. Firstly, the conventional type of Government or Government aided schools which prepare students for the high school examination—Matriculation Examination of a State Education Board or a University (Uttar Pradesh, Haryana, Punjab, etc.). The second type of schools are the so-called public schools in India which prepare students for the Indian School Certificate (previously called Senior Cambridge) of Cambridge University.

The third type of schools are those Government or Government aided schools which prepare students for the Higher Secondary Examination of a State Education Board or a University (Delhi, Haryana, Punjab, etc.). In fact most of these schools were previously ordinary high schools preparing students for the Matriculation Examination, but have now been converted into higher secondary schools. Lastly are the set of schools newly coming up in the country called the Central Higher Secondary Schools which are under the control of Ministry of Education and Youth Services, Government of India, and prepare students for the All-India Higher Secondary Examination of the Central Board of Secondary Education.

In all the above four types of schools there are three distinct stages of education, i.e., the *Primary Stage*, the *Middle School Stage* (Junior High School) and the *High School Stage* or *Higher Secondary Stage* as the case may be. The duration of the primary stage in all the four types of schools is five years (classes I to V) after generally a year of previous schooling either in a nursery or a kindergarten class where the child has learnt the alphabet. The duration of the middle school stage is three years (classes VI to VIII) after the primary stage. While the high school stage in the first type of schools mentioned above is for two years only (classes IX and X), the higher secondary stage in the remaining three types of schools is of three years duration (classes IX, X and XI). A child therefore has ten years of pre-university schooling in the first type of schools and eleven years in the three latter types of schools.

Conservation education in various schools

The extent and quality of nature conservation education as included in the curricula of the above four types of schools were surveyed in the States mentioned earlier. The courses in which nature conservation is taught directly or indirectly are shown in Statement I. The course contents (in brief) of these courses are shown in Statement II.

A general review of the syllabi of the representative schools mentioned earlier, reveals that contrary to the general belief, there are adequate courses in nature conservation education at all the three stages of school education. Nature conservation education builds up from simple identifications in the primary classes, making the course as recreative as possible and avoiding any pre-mature analysis, on to an understanding of ecosystems and natural forces at the high school stage. Sufficient compulsory and elective courses exist at all the three stages for both arts and science groups for teaching nature conservation. While this is so, a student in case of high schools could make such a combination of compulsory and elective courses in the arts groups that he does not get a nature conservation course. Such a situation needs to be safeguarded perhaps by introducing a general science course for arts group students in the high schools alike the other schools. There is also the need of more ecological emphasis in nature conservation courses at the high school stage, to synthesize all the knowledge gained. This approach has to be ingrained into the students.

Necessary text-books for teaching these courses have been developed and prescribed in the syllabi. The text-books have been prepared by those who have a good understanding of the subject and are of good quality and well illustrated. These text-books are freely available to the students.

Extensive use of audio-visual aids like film strips, slides, pictorial charts, models, etc. etc. has been prescribed for teaching nature conservation courses in the syllabi of all the schools. Their availability is, however, inadequate except in public schools. Necessary audio-visual aids need to be provided in all schools for proper teaching of these courses.

One of the most important points in nature conservation education, however, is the basic understanding of the concept by the teachers which should be profusely reflected on the teaching methodology. Unfortunately there is a wide contrast between the quality of teachers in public and other schools and the quality of teachers declines sharply from urban to rural areas. While considerable progress has been achieved in the recruitment of trained and qualified teachers, the teaching in rural schools where a large majority of our children study and who really need to be given nature conservation education, continues to be mechanical. Generally the teachers in these schools do not have a clear understanding of the concept of nature conservation because they never had an opportunity of any suitable training for education in the subject.

A perusal of the syllabi of the teachers training courses do not show any emphasis on teaching methods in nature conservation. As a matter of fact for all science teachers including those required to teach nature conservation, a distinct emphasis on the methods of teaching natural sciences to children in various stages of schooling is inevitable, both in the teacher training curricula and in the service workshops and training camps etc. In fact separate courses need to be given to nature conservation teachers to make them discharge their obligations fully. There is a realisation already on this issue and the teachers training syllabi are being revised conforming to the recommendations of the Education Commission of India. Junior Basic Teachers training courses is an example where since recently emphasis is on that teachers should know more of the subject they are expected to teach. Like-wise the course contents have been streamlined. A very important feature of the syllabus is that it is more practical than theoretical. The teachers will also conduct observational case studies to develop deep insight into the intricacies of child behaviour.

While the future generations of teachers have a better opportunity to learn nature conservation concept during their education and training, the weakness in the case of existing teachers, can be overcome by arranging in-service seminars and courses on a large scale to cover the mass of our teachers particularly from the rural areas. In this connection it is encouraging to note that the National Council of Educational Research and Training has started arranging summer seminars for teachers all over the country. These are primarily orientation courses for teachers, of 6-7 weeks duration, in which teaching methodology is mainly discussed. Nature conservation teaching methodology needs definitely to have a place in such seminars. While arranging of these seminars is a welcome step, this is not adequate as the majority of our teachers in rural areas hardly get an opportunity to attend such seminars. It is in this rural population of our teachers that the quality of teaching in nature conservation needs to be improved and special efforts made to fill this lacuna.

An evaluation of the student community in this study has also revealed that by and large they are not as motivated on nature as needed except in public schools. Outdoor and extra-curricular activities, which are so very essential in a subject of this kind are very inadequate generally. Mechanical teaching of natural sciences fails to stimulate the minds of students into a spirit of enquiring and to have a co-ordinated picture of the universe around us as a part of normal behavioural pattern. To a great extent the fault lies in the understanding of teaching staff itself rather than in facilities. Nature exists every where, one has just to step outdoors and observe.

Forest Service : Pioneer in Nature Conservation Education

The Forest Service of the country which is now over a century old, has been a pioneer in nature conservation in the country. This is reflected not only in our policies, laws and management but also in our organisation where a public education organisation in the form of publicity units exists. The Central Board of Forestry which is the highest forest policy making body in the country, has been alive to the question of the status of nature conservation education in the schools and has successfully played a positive role in this field.

In order to increase interest in trees and forests on a national scale a tree planting week—VANA MAHOTSAVA—is being celebrated annually when millions of seedlings are planted all over the country by the student community. Patel Shield and Munshi Shield are All-India Silver Trophies awarded every year for the best performance by any institution including the schools and by any University including its affiliated colleges respectively.

The Indian Board for Wildlife constituted in 1952 has continued to popularise wildlife conservation by introducing stories in school text-books, by producing attractive charts, by organising special lectures and through the establishment of zoos and zoological parks in the neighbourhood of large cities. A wildlife week is being celebrated all over the country in the first week of October each year to educate the public regarding conservation of animal life of the country besides creating a consciousness among the teachers and the students. Actually the most enthusiastic participants are the students. Posters, films and other publicity material are exhibited in schools, besides arranging popular talks and radio interviews. Essay and photographic contests on wildlife protection are arranged for school and college boys as also on the spot painting competitions and prizes awarded.

Forest Service in the States and also the Forest Research Institute and Colleges can be relied upon by Education Department to conduct short courses for rural teacher to give a clear concept of nature conservation.

Role of other agencies

The role of various other organisations is no less in attainment of the present status of nature conservation education in our schools. The Bombay Natural History Society maintained a sustained pressure to achieve the goal. The society has published for children a series of natural history books entitled Glimpses of Nature. The Bird Watchers Field Club of India sponsors field trips and encourages children to know our beautiful birds. The Wildlife Preservation Society of India carries out publicity and propaganda for the preservation of wildlife in India by means of their journal, "Cheetal", monographs, bulletins, films, etc. among youth of the country. The Wildlife Club at the Forest Research Institute and Colleges, Dehra Dun, and the Nilgiri Wildlife Association arrange annual essay competitions on wildlife both in English and Hindi for school and college students and award prizes for the same.

In our numerous zoos, zoological parks, sanctuaries and museums in the country school children are allowed free entrance at all occasions when wildlife conservation is emphasised. Youth camps have been thought of for sometime past, but the movement has not yet developed adequately. In our Boy Scout movement special badges of attainment in various aspects of nature conservation have not yet been introduced following the example of U.S.A. and Canada but

certain amount of nature conservation education is undoubtedly aimed at. Badges on forestry, bird watching, wildlife conservation, soil conservation etc. could be usefully introduced.

International Education Year

The United Nations has designated 1970 as the "International Education Year" to be observed all over the world. The reason for this special year for education is that everywhere in developed and developing nations alike, education is in crisis. Unprecedented population growth, especially in developing nations makes it difficult for most countries to build enough schools, train enough teachers or provide enough books for their children. Reform and modernisation in methods and content of education are behind times and much of the educational structure, more so in developing countries, remains very much behind. The goal of the International Education Year is to bring about changes in policies and practices in education and training. It is a lucky coincidence that the Tenth General Assembly of the IUCN is being held in India just preceding the "International Education Year". The subject of nature conservation education in schools is vital, to the development of natural resources of any country. The detailed narration of experiences in this country given in the paper will, it is hoped, be of use to other countries.

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STATEMENT. I

Nature Conservation Courses

Institution	Courses at different stages in which Nature Conservation is taught				
	Primary (Class I to V)	Middle (Junior High School) (Class VI to VIII)	High School (Class IX and X)	Higher Secondary (Class IX to XI)	
(1)	(2)	(3)	(4)	(5)	
1. High Schools (Uttar Pradesh)	<i>Compulsory Courses</i> 1. Social Studies 2. General Science	<i>Compulsory Courses</i> 1. Social Studies 2. General Science 3. Agriculture and Allied Art	<i>Elective Courses</i> 1. Geography } 2. Commercial } for 3. Economics } Arts 4. Agriculture } 5. Biology } Science 6. Physics } Group 7. Chemistry }		
2. Public Schools (All-India)	<i>Compulsory Courses</i> 1. Social Studies 2. Nature Study	<i>Compulsory Courses</i> 1. Social Studies 2. Science 3. Geography	–	<i>Elective Courses</i> 1. Geography } 2. Biology } for Arts 3. Physics } Group 4. Chemistry } for Science Group	

Contd.

STATEMENT I—Concl'd.

(1)	(2)	(3)	(4)	(5)													
3. Higher Secondary Schools (Punjab, Haryana, Delhi, Jammu & Kashmir)	<p><i>Compulsory Courses</i></p> <ol style="list-style-type: none"> 1. Social Studies 2. General Science 	<p><i>Compulsory Courses</i></p> <ol style="list-style-type: none"> 1. Social Studies 2. General Science 3. Agriculture 	-	<p><i>Compulsory Courses</i></p> <ol style="list-style-type: none"> 1. Social Studies 2. General Science <p><i>Elective Courses</i></p> <table style="margin-left: 20px;"> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">3. Geography</td> <td rowspan="3" style="font-size: 3em; padding: 0 10px;">}</td> <td rowspan="3" style="vertical-align: middle;">for Arts Group</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">4. Economics</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">5. Commercial Geography & Economics</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">6. Agriculture</td> <td rowspan="3" style="font-size: 3em; padding: 0 10px;">}</td> <td rowspan="3" style="vertical-align: middle;">for Science Group</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">7. Biology</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">8. Physics</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">9. Chemistry</td> <td></td> <td></td> </tr> </table>	3. Geography	}	for Arts Group	4. Economics	5. Commercial Geography & Economics	6. Agriculture	}	for Science Group	7. Biology	8. Physics	9. Chemistry		
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5. Commercial Geography & Economics																	
6. Agriculture	}	for Science Group															
7. Biology																	
8. Physics																	
9. Chemistry																	
4. Central Schools (All-India)	<p><i>Compulsory Courses</i></p> <ol style="list-style-type: none"> 1. Social Studies 2. General Science 	<p><i>Compulsory Courses</i></p> <ol style="list-style-type: none"> 1. Social Studies 2. General Science 	-	<p><i>Compulsory Courses</i></p> <ol style="list-style-type: none"> 1. General Science <p><i>Elective Courses</i></p> <table style="margin-left: 20px;"> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">2. Geography</td> <td rowspan="3" style="font-size: 3em; padding: 0 10px;">}</td> <td rowspan="3" style="vertical-align: middle;">for Arts Group</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">3. Economics</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">4. Commercial Geography</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">5. General Agriculture</td> <td rowspan="3" style="font-size: 3em; padding: 0 10px;">}</td> <td rowspan="3" style="vertical-align: middle;">for Science Group</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">6. Biology</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">7. Physics</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 5px;">8. Chemistry</td> <td></td> <td></td> </tr> </table>	2. Geography	}	for Arts Group	3. Economics	4. Commercial Geography	5. General Agriculture	}	for Science Group	6. Biology	7. Physics	8. Chemistry		
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5. General Agriculture	}	for Science Group															
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8. Chemistry																	

STATEMENT II

Course Contents of Nature Conservation Courses**I. High Schools** (Affiliated to a Education Board of a State or a university)1. *Primary Stage*

(i) *Social Studies*: District and State maps; natural physiographic divisions of the district and State; climate; names of different agricultural crops; crops grown in the district and the State; population.

(ii) *General Science*: Plants and animals of the locality; beneficial effects of plants and animals; parts of a plant and their functions; description of some typical plants, animals, birds and insects; crops, flowers and fruits of different seasons; seed, its dispersal and germination; climate and soil and their effect on plants; agriculture crops, agricultural practices; animal husbandry; local observational excursions to nearby agricultural fields and forests.

2. *Middle School Stage*

(i) *Social Studies* (Geography): Local studies including observation during excursions of physical features, drainage, natural vegetation, agriculture produce of the neighbourhood; physical geography including latitudes, longitudes, mountains, their formation, volcanic belts, classification of land forms, environmental factors, soils, their formation and classification, soil erosion and conservation; world geography including natural regions of the world, distribution of land and water masses on the globe, water-power resources of different countries, world forests, their uses and exploitation; geography of Asia and India (in greater detail) with special reference to relief, climate, natural regions, natural vegetation, crops, etc.; reading of different types of maps; taking weather observations; maintenance and interpretation of weather records.

(ii) *General Science*: Studies of animals and plants as our friends; human physiology; seed, its germination, parts of a plant and their importance; life processes of plants; solar system; general lessons in physics and chemistry.

(iii) *Agriculture and Allied Art*: Soils, their formation and classification; soil erosion and soil conservation; climatology; seed and its germination; crops and agricultural practices; animal husbandry and dairying; co-operative farming; extension services; rural sanitation; environmental hygiene. Students undertake all agricultural operations on the farm.

3. *High School Stage*

(i) *Geography*: Geography of the world and India with regard to physical geography, general geography, and economic geography; world geography—earth in the solar system and its movements, earth's crust including continents, oceans and islands, major land forms and their characteristics, soil erosion and agencies of erosion, atmosphere including general composition of atmosphere, temperature and its distribution, rainfall and its distribution, climatic regions of the world; geography of the continents as regards physical features, drainage, climate, natural vegetation and population; economic geography of selected countries regarding chief crops, natural resources, major industries, trade and transport; geography of India and the State in which the school is located as regards location, area, physical features, drainage, climate, natural vegetation, animal life, soils, natural resources including chief forest products and major crops, multipurpose projects, transport; population; trade.

(ii) *Commercial Geography*: Same as for Geography Course above with more emphasis on the natural resources of world, India and the State in which school is situated.

(iii) *Economics*: Physical features and climate of India; importance and bearing of forests on Indian agriculture; agriculture crops and produce; irrigation and fertilizers; animal husbandry, its importance and problems; industries; transport and communication; Five-Year Plans.

(iv) *Agriculture*: Climatology—weather and seasons in India, rainfall and its variation and effect on crops; soils—weathering, soil formation and classification, soil properties, soil erosion and conservation; crops and agricultural practices; horticulture; animal husbandry and dairying; co-operative farming; agricultural operations undertaken by the students on the farm.

(v) *Biology*: Inter-relationship of plants and animals and their values to man; broad classification of animal and plant kingdoms with familiar examples; cell and cell biology including animal and plant cells, tissues; simple to complex organisms; various life processes of living organisms; study of typical animal (Frog) in detail and its comparison with man; studies of typical plants; practical studies with the help of common examples and museum specimens.

(vi) *Physics*: } Lessons in physics and chemistry regarding physical and chemical properties of matter to create a basis for understanding various phenomena
 (vii) *Chemistry*: } occurring in nature.

II. Public Schools (Indian School Certificate of Cambridge University)

1. Primary Stage

(i) *Social Studies*; Observing the surroundings including how animals and plants live grow and keep healthy ; animals and birds in our life wild animals and birds, and different types of forests; regional geography of Commonwealth including India with regard to location, size, physical features, climate, flora, fauna, agriculture, population, industries and trade.

(ii) *Nature Study*: Observing flora and fauna in the surroundings; identification of common flowers, plants, birds and animals, their external characters and good habits; seeds and germination including recording stages of growth and keeping pictorial charts; gardening including vegetative reproduction and growing of seedlings in the garden; plant life in various local habitats; plant parts and their functions (selected plants); selected types of animals to depict stages of evolution; detailed studies on frog, fly and mosquito.

2. Middle School Stage

(i) *Social Studies*: Regional geography of the Commonwealth countries including India (in detail) with regard to their location, size, physical environment, natural resources, agriculture, population, industries and trade.

(ii) *Science*: Earth-rocks, weathering, erosion, earth-quakes and collection of different rocks; soil formation, minerals, top and subsoil, soil erosion, soil conservation and observing better methods of cultivation in the field; treasures from the earth; weather and weather activities; properties of living things; differences between plants and animals and their uses familiar flowering plants, plant parts, seed and germination: physiology of animals.

(iii) *Geography*: Physical geography—earth and its movement, longitudes and latitudes, temperature, rainfall, winds, four main climatic regions, making of maps, charts, diagrams and sketches to illustrate the above; climatic and the vegetational zones of the world in general and Asia, Europe, Australia, Africa and the Americas in detail with examples.

3. *Higher Secondary Stage*

(i) *Geography*: General geography—map work, interpretation of maps, pictures and making a number of maps and pictures; physical geography—earth, major land forms and agencies modifying them, agencies of erosion, climate and its factors, world climates, distribution of natural vegetation; world human geography—world populations, major resources, major world farming types; regional geography—natural resources of Africa, Europe and Asia including India and geography of local region (in detail).

Biology: Life processes of living organisms; soils, soil formation; relationships of plants and animals to their environment (ecological studies in different habitats); invasion and colonisation; crop plants and their associated organisms; practical work.

(iii) *Physics*: } Little more advanced than under High Schools at the High School Stage.
 (iv) *Chemistry*: }

III. Higher Secondary Schools (Affiliated to a Education Board of a State or a university)

1. *Primary Stage*

(i) *Social Studies*: Importance of air, water and plants to man; short descriptions about our mountains, seasons, soils and agriculture; water and irrigation; minerals; forests and their advantages; climate and its importance; climatic types of the world.

(ii) *General Science*: Identification of common animals, birds, insects, plants, flowers, agriculture crops, fruit trees, interdependence of plants and animals and their uses to mankind; seeds and their germination; parts of a plant and their functions; life processes in plants; seasonal agricultural crops; soils, rocks and minerals; climate and water; food habits of common animals, insect and birds and their reproduction.

2. *Middle School Stage*

(i) *Social Studies* : } Environment; rocks, soils and minerals; atmosphere (temperature,
 (ii) *General Science*: } rainfall, seasons); plants and animals and their uses to man; seed, germination, vegetative reproduction; life processes of plants and animals; structure of living beings; classification and life history of living organisms; physiology of human body; adaptation to environment by living organisms.

(iii) *Agriculture*: Same as for Agriculture and Allied Art courses under High Schools at the Middle School Stage.

3. *Higher Secondary Stage*

(i) *Social Studies* : Physical features, climatic conditions, natural resources, main agricultural and industrial activities of India.

(ii) *General Science*: Earth and the solar system; physical environment and atmospheric agencies; rocks, soils and soil formation; general classification of plants and animals and their

uses; protection of animals and plants; plant parts life processes of plants and animals; evolution and human physiology; practicals; excursions for outdoor observations.

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| (iii) <i>Geography</i> : | } | Same as under High Schools at the High School Stage. |
| (iv) <i>Economics</i> : | | |
| (v) <i>Commercial Geography and Economics</i> : | | |

(vi) *Agriculture* : Biology and agriculture; agriculture—rocks and soils, soil formation and properties; tillage practices; soil fertility ; importance of water to plants including water requirement of crops, irrigation drainage; soil erosion and conservation; classification of crops including studies on different crops; horticulture; weeds; farm management; practical work on the school farm.

(vii) *Biology*: Living and non-living things and their differentiation; units of plant and animal structure (cells and tissues); plants and animals and their characteristics and classification; plant life including flowering and non-flowering plants and their external and internal morphology and various life processes; animal life including invertebrates and vertebrates with a detailed knowledge of certain typical examples; evolution and heredity in plants and animals; practicals and demonstration through film strips, experiments, models, pictorial charts and other audio-visual aids; field work.

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| (viii) <i>Physics</i> : | } | Little more advanced than under High Schools at the High School Stage. |
| (ix) <i>Chemistry</i> : | | |

IV. **Central Schools** (Affiliated to Central Board of Secondary Education)

1. *Primary Stage*

(i) *Social Studies* : Short pictorial description about domestic and wild animals, climate and climatic elements; water and land; major land forms (mountains and rivers of the world); India—land forms, soils, agriculture and forests; map reading.

(ii) *General Science* : Air, water and weather; rocks, soils and minerals including soil erosion, agencies of erosion and soil conservation; living things and their characteristic, difference between plants and animals and their usefulness to man; plant and animal life including their external morphology and various life processes; seed dispersal and germination; animals and plants in different surroundings.

2. *Middle School Stage*

(i) *Social Studies*: Earth and the solar system; atmosphere; major land forms; climate, climatic and vegetation types; crops and agriculture; river systems, emphasis is on countries in Asia with greater details about India.

(ii) *General Science* : Importance of plant and animal life; classification of plants and animals; external morphology; life processes of animals and plants (giving typical examples from each class); protection of our flora and fauna; soil conservation.

3. *Higher Secondary Stage*

(i) *General Science*: Earth—rocks, minerals and soils, soil formation, erosion and soil conservation; solar system; environment; living and non-living objects; cells, tissues, and organs; life processes of plants, growth and reproduction; organic evolution; different kinds of plants;

crops—seasonal crops and crop rotations; different types of animals (domestic and wild animals) and uses of animals to mankind; protection of vegetation and wildlife; practicals, demonstration and field excursions.

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|---|---|---|
| (ii) <i>Geography:</i> | } | Same as under High Schools at
High School Stage. |
| (iii) <i>Economics:</i> | | |
| (iv) <i>Economics and
Commercial Geography:</i> | | |

(v) *General Agriculture:* General agriculture—soils including soil erosion and its control, reclamation of saline and alkaline soils, soil fertility and manures, tillage practices, irrigation and drainage, weeds, and crops; farm management—cropping systems and crop rotation ; animal husbandry, care and management of farm animals, feeds and feeding, diseases, poultry and bee keeping; practical work on the school farm, observations and experiments.

(vi) *Biology:* Plant and animal life—similarities and differences between plants and animals, their classification and economic importance; diversity of plant life—flowering plants, major groups of plants and their characteristics; diversity of animal life; plant and animal physiology; heredity, evolution and adaptation; factors of environment; habitats and communities; effects of various environmental factors; man and his environment; interdependence of plants and animals; biology and human welfare; new sources of food; improving the livestock and crops; conservation of forests and other natural resources; practicals and field excursions.

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| (vii) <i>Physics:</i> | } | Little more advanced than under High School at High School Stage. |
| (viii) <i>Chemistry:</i> | | |

PROBLEMS OF 'CONSERVATION OF NATURE' IN THE SCHOOL CURRICULUM IN INDIA

By

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The importance of conservation of nature has been realized by the technologically advanced society and there is hardly any need to emphasize the same again and again. In rural areas, the environmental and conservation education is gaining importance.

The protection of environment, a careful treatment of nature and the rational use of natural resources are some of the aims of conservation education in rural areas. But the problem of introducing the concept of nature conservation is by no means simple. Some of the children exposed to biology as an experimental science in the present day are not even aware of the great impact of human society on the balance in nature. The rapid industrial development and the urbanization of the rural areas have led to the decrease of many species of the flora and fauna in the countryside. The uncertain monsoons, the pressure of land for production of food and cash crops and the location of several projects in rural areas have all pushed the frontiers of jungles farther and farther and have made inroads into what was once a luxurious natural biome in many parts of India. Under these circumstances it is not surprising that many children in schools are not even aware of the vast potential of animals and plants in our country. The gradual disappearance of many animals like the cheetah, the rhinoceros, the tiger and the lion is an eye-opener.

Man is specially responsible for developing methods and techniques to use the resources of nature and conserve the same. In addition to cultivating the habit of careful treatment of nature as a whole in rural areas, it is also useful to lay down certain recommendations for the most rational use of natural resources, and for the best use of the soil in the farms.

Conservation education to be effective must be given to members of the population in the rural areas and it is best begun when they are young and still in schools. The village school remains an important source of information and a channel for propagating new knowledge not only for the future but also for the present farmers.

Taking into account that in India the majority of population live in rural areas, the above-mentioned considerations along with the more general principles of conservation of nature have been given appropriate attention while developing the new syllabi and instructional materials in biology undertaken by the Department of Science Education in the NCERT.

Two sets of curricular materials have been prepared, one by the biology group in the Department of Science Education for Classes I-XI and the other by the Biology Study Groups set up by the NCERT consisting of Professors and others at some university centres.

Conservation Education in the Existing School Syllabus

In the majority of States in India, the existing General Science syllabuses for the middle school and the biology syllabuses for higher secondary schools contain some elements and topics regarding conservation of plants, animals and soil; and the prevention of air and water pollution.

Conservation Education in the New Syllabus prepared by the Department of Science Education

It was felt that a better impact of the need to conserve natural resources could be emphasized on the minds of the school children by placing a greater emphasis on the abounding natural resources available in the country and how these resources are gradually diminishing due to intervention by man. In following these topics the child learns to love and respect the things that surround him.

The syllabus for the school has been prepared for three levels; for primary schools (classes 1—5, 5+ to 10+ age group) the middle schools (classes 6—8, 10+ to 13+) and the high (secondary) schools (classes 9—11, 13+ to 16+). Topics concerning conservation of plants, animals, soil, air and water are included as also a special section completely devoted to Conservation of Nature. An environmental approach runs through the entire biology course for the middle school and special chapters on ecology for the high school. These give the students a basic knowledge of the close inter-relationships and interdependence in nature.

Primary School

The biology sections of the general science course for primary school contain elements of conservation of water, atmospheric air and soil, and some facts about plants and animals in the environment. When dealing with "Rocks, Soils and Minerals", concepts about erosion and man's attempts to control their action are included. The pupils are made aware of the diversity of plants and animals and their adaptations to environment and to each other. The importance of plants and animals is also stressed.

Middle School

The text-books, teachers' guides and other materials prepared for the three years deal mainly with a systematic study of plants, animals and man. These books contain some concepts and topics regarding conservation. Each chapter of the biology syllabus for classes 6 and 7 gives some materials about conservation of plants and animals. For instance, in the botany course (class 6), the chapter "Plants and their environment" provide pupils with definite ideas of the rational and careful use of plants. In the zoology course (class 7) the chapters on 'Arthropoda', 'Fishes', 'Birds', and 'Mammals' include special topics concerning natural and economic significance of these groups and the care of the useful species. In the last chapter of zoology course a special stress is laid on the inter-relationship of the living and non-living things in nature and on the dynamic equilibrium in nature. On this base, pupils would understand the necessity for conservation of nature as a whole and would cultivate a sense of responsibility for a careful treatment of natural resources. The material for this is mostly provided in the teachers' guide, particularly in the concluding chapter of the zoology course.

In class 8 the biology course concludes with an important section on "Man and his Environment". This is a summary of the entire biology course from the ecological angle, and also serves to bridge the middle school biology with the high school biology. The last part of this section is "Man and Conservation of Nature".

Thus, conservation education runs through the entire syllabus and also forms a part of the final section of the biology course of the middle school. A pupil, at the end of the 8th class—many of whom go to agriculture, industry, forestry, commerce etc.—gets the main ideas about the careful treatment of nature. He can, and we hope he will use this knowledge in his every-day work and life.

High School (Secondary School)

The course of biology at the high school includes topics on different levels of biological organizations like :

1. Molecules and cells
2. Organisms
3. Populations and natural communities.

Part IV of this course (for class 9) is entirely devoted to Ecology (85 periods). The chapter on "Natural Communities" (56 periods) in the first year of high school (d. g.) consists of four sections, 1. Populations (12 periods); 2. Ecosystems (16 periods); 3. Biosphere (12 periods); and 4. Conservation of Nature (16 periods). The last section on conservation of nature deals with conservation of plants and animals, conservation of air, water resources and soils. It also includes topics on analysis of the causes for disturbance of the normal processes in the biosphere, conservation of natural landscapes, the history of the movement for conservation of nature, and the Indian and international efforts in the field of conservation of nature. Based on the theory of the entity of the biosphere, this section "Conservation of Nature" contains an analysis of man's inter-relations with nature as well as a consideration of the ways of maintaining our environment in the days to come. The normal balance in nature and consequently the guarantee that life will exist on the earth, depends not only on our understanding of this principle, but mostly on our energetic action towards conservation of nature.

Conservation Education in the School Curriculum as spelt out by the Biology Study Groups

The Biology Study Groups of the NCERT have prepared another variant of the syllabus in biology for the middle and high schools. The problems relating to conservation of nature have been tackled by these groups also. The Study Groups have placed a great emphasis on the abundant natural resources and how these are being reduced due to careless handling by man. It stresses the close connection between agricultural production and nature conservation. While Book I gives an account of the variety of living things, the features of their life structure and the physiological aspects, Book II attempts to give an account of vital processes in both animals and plants. In Book III which has an emphasis on the human species, the relationship of microbes and man is dealt with extensively leading on to personal hygiene and the various aspects of agriculture in our country.

A more detailed approach to conservation is attempted in stage II of the curricular materials which are now being prepared for children of the age 13+ to 15+. In this stage, i.e., the senior high school, the emphasis is shifted from an indication of the vast areas of resources to a study of the detailed factors of the environment and the interactions to the various types of organisms. Thus Book IV of the second stage deals mainly with 'Ecology of Life' in various environments, the web of life, the natural cycle of materials, and culminates in a chapter on conservation of biological and natural resources including wild life preservation. The whole series end;

in Book VI where the last chapter entitled "Man and Nature" will help to focus attention on man's fight against hunger, disease, death and other factors. To reinforce the concepts developed the Study Groups have also initiated the bringing out of a large number of Supplementary Readers. These readers cover one aspect or the other of our natural resources of plants and animals and also the predators that diminish our resources.

In contrast to the traditional pattern of presenting a study of facts on conservation of natural resources, a study of ecology vis-a-vis organism as a whole and as groups in relation to the different environments in this country would better highlight both the potentialities of natural resources that exist and enable constructive thinking to follow. It should be remembered that one of the basic aims of the course is to develop an influence on the mind of the young children to indicate the social implications of biology in relation to the life of other organisms and how far a study of physiological ecology could bring about a better balance in nature than what exists at present.

Implementation of Conservation Education in India

As was mentioned earlier Conservation Education is taking root in Indian schools. New text-books and teachers' guides have been published by the NCERT, and with the assistance of UNESCO experts. The books for the middle school classes are ready and they are being used in about 500 schools in Delhi, and 120 Central Schools all over the country. Besides these some States like Andhra Pradesh, Gujarat, Kerala, Mysore, Manipur and Madras have shown interest and have adopted or adapted these materials for experimental teaching. Work is now in progress on the text-books and teachers' guides for the high schools. The Study Groups have also completed work on middle school materials which have been published and they are now working on high school materials.

All these efforts give us hope that conservation education in Indian schools will be practised on a wider scale. If this process proceeds with a faster speed the majority of children in India will have an opportunity to be acquainted with ideas and practice of conservation of nature. The new generation, in about 10-20 years, will be able to prevent destruction of nature. If we are to succeed we need co-ordinated efforts on the part of school educators at all levels in the Centre and in the States. The efforts to make an impact of conservation education on the pupils will be effective only when every school teacher and every pupil in the schools in India begin to consider the idea of a careful and rational treatment of nature and its resources.

In this connection we feel particularly pleased by the fact that the President of India, The Hon'ble Mr. V. V. Giri specifically emphasized in his speech at Hyderabad on October 5, that basic education about conservation and management of wild life and forests must be included in the curricula of studies in schools. We are happy to state that the syllabus drawn up and the curricular materials prepared by the NCERT have included in them the essentials of conservation of nature. They have shown a keen awareness to the problems of conservation education and the necessity to use the natural resources in a rational way.

When the syllabus is accepted in most States we would find ourselves in a position where the first step has been taken for imparting conservation education to the pupils in the rural areas.

CONSERVATION EDUCATION IN CHEMISTRY TEACHING

By

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We are living in the midst of a rapidly increasing scientific and technological revolution. Everyday we hear the news of completion of construction of new blast furnaces, chemical factories, power stations, the development of new powerful machines, etc. In this progress, chemistry plays a special role and chemical industry helps to meet the requirements of society ranging from common salt to synthetics, clothing and man-made food.

Though the scientific and technological progress of the industry of our century is becoming ever more rapid, the "food" for it still comes from the natural resources—above all water, the resources of the earth and all that can grow and develop on our planet. In spite of the fact that the water resources on earth are limitless, the human community is already experiencing and will be increasingly experiencing a shortage of fresh water.

The clear air our ancestors breathed is at present polluted in big cities and industrial centres. Water, air and soil are essential necessities for everything that grows and lives on the earth. However, the rapidly developing chemical industry and related industries along with the benefits they are increasingly giving to mankind also produce waste which pollutes the air, water and soil. A particularly dangerous threat to living nature is the development of atomic power generation and the development of the industrial production of modern polymeric materials.

The atmosphere of the larger cities such as New York, London, Paris, Moscow, etc., is being polluted by the discharged gases of the motorcars and the "smoke" of industrial enterprises. Thus; in New York upto 3,200 tons of oxides of sulphur (which in terms of sulphuric acid equals to 5,000 tons), 230 tons of dust and 4,200 tons of various gases are discharged into the atmosphere daily. In Los Angeles the atmosphere of the city streets becomes polluted by 12,000 tons of chemical wastes mainly oxides of nitrogen and carbon mono and dioxide. The acceptable concentration of carbon monoxide is $4\text{--}5\text{ mg/m}^3$ whereas in many big industrial centres and cities it reaches $200\text{--}300\text{ mg/m}^3$ —thus exceeding tens of times the acceptable norms.

While such gases as carbon monoxide, sulphur dioxides, oxide of nitrogen and hydrogen sulphide affect man and animals immediately as poisonous substances, the dust in the air pollutes it and at the same time carries various micro-organisms causing severe diseases in man and animals.

The greatest damage in recent years has been caused to the water reservoirs of the earth and above all to the rivers and lakes. Recent news about a large scale poisoning of fish in the Rhine and the death of birds on the English Coast has caused grave alarm to all the people of the earth.

Everyday, rivers are polluted with the products of the petroleum industry and crude oil during transport. The so-called water wastes from various industrial enterprises discharged into water reservoirs escape calculation. Suffice it to point out that only two soda producing factories of medium capacity discharge easily upto 3 million tons of wastes containing common salts, ammonium chloride, carbonic acid and other substances in solid state. Upto 10,000 tons of water is needed to rinse only one thermal power station. This water is then discharged. This water is polluted with organic and inorganic acids and oxides of iron, calcium and other metals.

Enormous stream of water wastes not only pollute water and make it useless for the living organisms but they also spoil the soil changing the pH of the soil solutions.

The sediments of the water wastes also serve as good food for micro-organisms and viruses.

The rapid development of the polymer materials industry is inevitably connected with the so-called discharge gases, one of which is hydrogen chloride. Rough estimates show that in the USSR alone the plants producing industrial polymers discharge, in terms of hydrochloric acid, upto 3.5 million tons of hydrogen chloride while maximum amount of hydrochloric acid necessary for the economy of that country is not more than 0.5 million tons. Millions of tons of hydrochloric acid have to be "discharged". But the question is where ?

Pink orange clouds of "smoke" are discharged by the plants producing nitric acid, the amount of which is ever increasing. Thus beautiful wastes containing oxides of nitrogen poison the air and water and kill plants and animals.

It is difficult to realize the scope of the disaster mankind is facing in connection with the development of atomic power generation. Suffice it to say that according to scientists and engineers forecast an atomic power station with the capacity of 10 million kilowatts will be commissioned daily starting from the year 2000.

The problems of the disposal of the radio active wastes of atomic energy plants is yet far from being solved. The gases in the air, the pollution of the water, the salination of the soil and the changing pH of the soil solution not only poison and spoil nature but also drastically disturb the equilibrium in nature.

The human community is under the threat of a catastrophic destruction of nature. One would think that under such circumstances literally every human being on our planet should realize the scope of the impending disaster and begin to realize it while still a child and be aware of at least the most elementary measures aimed at the conservation of nature. However, to our greatest regret and disappointment, school text-books of chemistry and physics provide the children with no information on this question. And this is so when almost any topic of the chemistry course starting from the middle school level provides material connected with the conservation of nature. Take, for example, such topics in the middle school syllabus as burning of oxygen, water, carbon dioxide, preparation of sulphuric and hydrochloric acids and their salts.

At the level of the high school such topics would be: nitric and phosphoric acids, alkalies, blast furnace, production of metal, preparation of soda, polymers, electrolysis and others. In other words while studying chemistry, it is necessary to know, alongwith the benefits that chemistry gives, the destructive effects on nature caused by chemistry and chemical industry.

The question arises: Given modern industry, is it at all possible to breathe clean air, have clean water in the water reservoirs of the planet, avoid salinating the soil and disturbing natural equilibrium? This question should be answered categorically. Yes, it is possible.

Modern technology makes it possible to eliminate harmful effect of the discharged gases by means of the so-called catalytic completion of their burning with subsequent absorption of carbon mono-oxide and other gases. Technologically it is also possible to catch the smoke being discharged by various furnaces and at the same time to extract the valuable products contained in the fuel gases.

Ion exchange installations can automatically clean the water wastes of any industrial enterprises.

The problem of disposal of the products of atomic energy can be solved in principle by using outer space or one of the neighbouring terrestrial planets.

Rough estimates show that the expenses over the measures to be taken to conserve the air, water and soil and consequently plants and animals will be fully compensated by using the products obtained from the processed wastes. Thus, the fuel gases of many industrial enterprises contain valuable metals the extraction of which will make up for the expenses incurred to extract them. This, of course, is just an outline of the possible ways of the conservation of nature.

All this information should be provided to the children of the school age in comprehensible forms and in accordance with the level of their knowledge. The utmost necessity of this information for the rising generation is obviously beyond any doubt.

Alongside with this, it is necessary through UNESCO and National Organizations to familiarize the population extensively with the impending threat of destruction of the natural wealth. This can be done through lectures, publication of popular science books, pamphlets and brochures. Evidently the time is ripe for serious scientific research on the conservation of nature on this planet. The funds spent on one experimental explosion of an atomic bomb could cover one year's expenses of a research institute.

The system of education at the school level is of great importance in the cause of propagating measures for the conservation of nature. "The time has come", writes the French scientist, A. Ducrog, "to acquaint children as early as possible with the modern achievements of science. Science education is necessary for all people. As everybody needs the knowledge of traffic rules today, tomorrow they will have to know the speed of light, what the volt and watt are? and what the distance from the earth to the Sun is?"

Similarly we could say that children must know not only the fundamentals of modern production but also their effect on the surrounding nature. All this is possible if the children study, beginning from the middle school, systematically, the science disciplines of chemistry, physics, biology and mathematics on a compulsory basis.

What is said above enables to draw the following conclusions :

(a) A systematic study, on a compulsory basis, of chemistry, physics and biology as individual science disciplines for all children of the school age.

(b) Inclusion in the syllabi and text-books of the topics connected with the conservation of nature as obligatory material.

(c) Wide propagation of the measures on the conservation of nature.

(d) Organization of research on the development of methods of conservation of nature.

With these objects in view the text-books of biology, chemistry and physics, being developed under the UNESCO Secondary School Science Teaching Project in India, include information on the conservation of nature. I shall just mention a few instances from the course of chemistry. Thus, while studying the chapter on water, consideration is given to the modern methods of purifying water, both natural and water wastes of the chemical plants. In the topic "electrolytic dissociation of ionides and their use for purification of water" are studied as well as the extraction of metals from water wastes. Considerable attention is given to various methods of catching dust. When the structure of the atom is studied both in the course of chemistry and the course of physics, attention is drawn to the role of the energy released in atomic fission and fusion and its effect on the living organisms. It should be noted that introducing in the text-books of chemistry, questions connected with the conservation of nature is just the first attempt. Instructional materials should be further improved in that direction.

The cause of the conservation of nature has at present gone beyond the framework of individual scientific organizations and institutions and become the concern of the wide public beginning with education at the school level.

The problem must be solved on a global scale. It is only through combined efforts of the engineers, scientists and statesmen of the earth that the impending destruction of the natural wealth of our beautiful planet could be thwarted.

NATURE EDUCATION IN INDIA

By

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Summary

Nature Education in India is easy thanks to the Indian natural environment, which is a living laboratory suitable for anyone to study nature and make continuous observations. At the same time it is difficult because it does not promise to open up any careers for naturalists. Specialization has become a limiting and narrowing factor.

Natural history can only be successfully taught if a beginning is made with the very young. The Bombay Natural History Society runs a Nature Education course as a kind of extra curricular activity taken up only if the persons concerned in particular schools respond to the opportunity. The scheme was started in 1948 with governmental financial assistance and a special Nature Education Organiser was appointed. He conducts visits to the Prince of Wales Museum, gives talks and outings for school children parties are also organized.

There is a regrettable lack of emphasis on the teaching of natural history and conservation in the Indian schools. This is the reason why even educated Indians are not really interested in their natural environment. This shortcoming has often been pointed out to the authorities and has been partially corrected in the revised science syllabuses which are now being followed by about 20 schools in Bombay with the approval of the Director of Education.

One of the big problems about teaching natural history and conservation arises from the fact that teachers themselves know very little about the subject. Very few of them are in a position to identify the commonest plant or bird or animal. Therefore a number of seminar workshops are arranged for teachers.

Further, it is essential to have suitable literature available. The Bombay Natural History Society has published several booklets in a series called 'Glimpses of Nature'.

With the aid of the Nature Education Organiser and with its publication programme, the Bombay Natural History Society is trying to do what it can with its limited resources to awake an interest in nature among young people. Conservation education needs to be imaginatively initiated, for it involves new ideas which come into conflict with our traditional attitudes. The problem becomes vastly more difficult when dealing with rural populations where instinct and tradition are still far more important than science and innovation. Some of the real problems causing a critical battle between education and ignorance are the cremation on the pyre of most of the Indians after their death (taking a heavy toll of our depleting forest resources) and the sanctity of unproductive cattle preventing the regeneration of forests and vegetation, leading to soil erosion and over exploiting the countryside in every way.

There is practically no conservation teaching in India today. Nature education and conservation must be woven into our school curricula as soon as possible.

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Nature Education in India is among the easiest and the most difficult things to deal with. It is easy because here, like everywhere else a living laboratory is around one for study and continuous observation. There is no square mile of Indian territory which is bereft of plants, birds, butterflies or insects. Dr. Salim Ali started his ornithological career by observing the common house sparrow nesting in the walls of the stables. He found that when the cock bird was shot the female immediately acquired a new mate, and this process apparently continued almost indefinitely. This simple observation fired his imagination and led him to a detailed study of the bird life of India. There are innumerable situations of this kind which a student can study and acquire a life long interest in. However, guidance and stimulation of the right kind is absolutely necessary, and this is what is not available.

But Nature Education in this country is a difficult subject in one way because it does not promise to open up any careers for naturalists. The concept of a liberal education where a student is expected to cultivate his mind and sharpen his sensibility purely for the sake of doing so is being abandoned and specialization now commences right from the 9th class of school, where children of 14 have to select the long and narrow road at the end of which they are supposed to obtain the careers of their choice. Specialization has become such a limiting and narrowing factor that graduates who have done their B.Sc's in avian biology are unable to name more than half a dozen birds of their surrounding areas, and the excitement of bird watching and of being in touch with the living environment has never found a place in their lives.

Natural history can only be successfully taught if a beginning is made with the very young. Nature study and conservation education must really go hand in hand, as one would only be concerned about conserving the things one has learned to recognise, understand and respect. It must be admitted with regret that apart from the dry fundamentals of botany or biology, no natural history as such is taught in any of our schools. As far as I am aware only the Bombay Natural History Society runs a Nature Education course of this kind, and here too it is a sort of extra curricular activity which is taken up only if the persons concerned in particular schools respond to the opportunity.

The scheme was started in 1948 with the financial assistance of the then Government of Bombay now Government of Maharashtra, with the object of creating interest in nature among children and teachers. A special Nature Education Organiser was appointed, and he was expected to make full use of the natural history section of the Prince of Wales Museum which has a fine collection of animals and birds. Parties of children are taken round the museum, and they are told the basic facts about our commoner birds, mammals and reptiles. Then, they have to note the field characters themselves from the observations they make in the museum. The life histories of birds, like the common Baya and Hornbills are described to them, and on the whole the children become very interested in these subjects, and look forward to the field visits which follow.

The Nature Education Organiser gives talks on allied subjects, for example, insect life locomotion in vertebrates, respiration in animals, dispersal of seeds, evolution, colour of butterflies, bird migration, migration of European Eels, devices of climbing plants, etc.

From time to time, there are outings organised for school children in parties of 15 to 25 each. Each outing is focused around a particular topic. In the monsoon field trips are arranged for a study of aquatic life, or to study nesting colonies of birds like the Bayas or to study the monsoon plants and insects which abound at this time. In winter the group studies bird migration and sea shore animals. In summer interest is focused on such things as flowering trees, and perennial shrubs.

During these outings attempts are made to collect specimens of aquatic animals and plants including tadpoles, insects and their larvae, worms, Molluscs, Crustacea and even minute animals like cyclops. The children get an opportunity to observe and study the metamorphosis in frogs and toads often from the spawning stage, and keep records of the development of insect and other forms of life. The collection of plants including both floating and submerging varieties, covers a number of algae and unicellular forms. For studying the life history of moths and butterflies, eggs are collected and for the silk-worm larvae are collected.

There is, as I said, a regrettable lack of emphasis on the teaching of natural history and conservation, in our schools. That is the reason why even educated Indians are not really interested in their natural surroundings. This shortcoming has often been pointed out to the authorities and has been partially corrected in the revised syllabus for science for standards 5th, 6th and 7th which includes the study of natural history. The revised science syllabus followed by schools in Bombay includes the study of trees, shrubs, mammals, birds, insects and some other invertebrates. Children in the 5th standard are expected to study and observe, throughout the year, at least 5 trees and record their observations, they are also expected to observe at least 5 species of birds, two of which should be migratory. At the end of the year a practical test is arranged for the children to see whether they can recognise a tree from its leaves and flowers and can identify birds and insects in the field. This revised science syllabus is now being followed by about 20 schools in Bombay with the approval of the Director of Education.

One of the problems about teaching natural history arises from the fact that teachers themselves know very little about the subjects. Very few of them are in a position to identify the commonest plant or bird or animal. Therefore a number of seminars, workshops, etc., are arranged for teachers so that they can get to know the basic facts about their environment.

If interest in natural history has to be sustained it is of course necessary to have suitable literature. In this field the Bombay Natural History Society has played an important part and published several booklets in a series called 'Glimpses of Nature'. Two are on birds, one on flowering trees, and one on wild animals. Each book has several colour plates and black-and-white photographs to illustrate the text. Another publication of interest in this connection is a set of plant study sheets. These contain general instructions for the observations of a plant throughout the year. There are several line drawings of trees and shrubs together with a questionnaire for each species and instructions about preservation of plant specimens.

With the aid of the Nature Education Organiser and its publication programme, the Bombay Natural History Society is trying to do what it can with its limited resources to arouse an interest in nature among young people.

I said above that natural history and conservation education should go hand in hand. But conservation education needs to be imaginatively initiated, for it involves new ideas which come into conflict with our traditional attitudes. When man first came on the planet he was essentially an exploiter, and all that he did was to cut a tree, hunt an animal, catch a fish or mine a mineral. Nature was vast and men were few, and his depredations had little effect on the environment as a whole. Because of this past background even the most sophisticated minds find it difficult to change the emphasis from exploitation to conservation. The problem becomes vastly more difficult when dealing with rural populations where these ideas are still firmly entrenched and where instinct and tradition is still far more important than science and innovation. To infuse a scientific outlook into the population is therefore the first requirement. At the Conference on the Application of Science and Technology to the Development of Asia held at New Delhi in August last year it was emphasized that science should be an integral part of the primary and

secondary education. "At the primary stage the emphasis should be on inculcating a scientific outlook rather than memorization of facts and teaching of science be centered on the direct experience of the pupils and related to their environment; the learning experiences should be broad-based and particular attention should be given to themes related to conservation of natural resources, nutrition and health." If this can be done everything else will follow easily and automatically. If this cannot be done conservation education, like other forms of book learning will lead to no material change, either in the minds or in the environment of the people.

Most Indians, at their death, are cremated on the pyre, which consumes 400 kgs of wood and this takes a heavy toll of our depleting forest resources. In the cities electric crematoriums are now becoming fashionable, and in the countryside too, alternatives to the pyre must be found. The sanctity of cattle is another stumbling block to conservation practices for large numbers of unproductive cattle prevent the regeneration of forests and vegetation and lead to soil erosion, and over-exploitation of the countryside in every way. It is obvious that human and bovine over-population is the main cause of our deteriorating natural assets and if this fact is clearly understood it may lead to some significant change in our attitudes to family planning and to our over-sentimental regard for our bovidae. It is really a battle between education and ignorance, and there is very little time to be lost.

As we stated above there is practically no conservation teaching in India today, and a start must be made from scratch. What should the aim be. It must obviously be to make every person understand the importance of our natural assets and to teach them to harvest them in such a way that they are not permanently impaired. We must learn to live on the income and not on the capital of the land. Every student must first of all be taught the importance of our forests and of our trees. Before a child is old enough to hold an axe he must have developed such a respect for trees that he would not ever wantonly lop off a living branch. To a large extent, I understand, this has been achieved in Germany where there are severe penalties for unauthorised cutting of trees. There is then the very important concept of the balance of nature, which few people have even heard about. In an age when pesticides and herbicides are getting so popular for pest and weed control, it is odd that no one appears to be aware of the role of birds in keeping insects under control. A young sparrow eats almost its own weight in insects and the vivid examples of what happens when birds are removed from the scene are available from the happenings in Holland in the 1930's, and in China more recently. In an agricultural country like India, students in the rural areas have a fine opportunity to see for themselves the variety of birds in their varying ecological niches and by observing their dependence and inter-dependence on one another can learn the basis of ecology and natural history in a most interesting manner, and they would then become ardent votaries of conservation.

If there is any single factor which will make a difference to the health and prosperity of rural India it is the availability of fresh water for irrigation and other uses. The dependence of ground water on forests is not properly appreciated and the need to prevent pollution of our rivers, lakes and ponds must be emphasized. An increasing number of cases of water pollution is being reported and rural communities must be alerted to the dangers involved.

Above all, the inhabitants of the countryside must be made aware of the priceless asset which they have in their natural environment. The great longing of the multi-millionaires who spend their lives in the artificial environments of New York, London or Bonn is to see unspoilt country and this longing will grow with the increasing urbanisation of the world. The Indian village will of course evolve and progress and acquire new amenities made possible by modern technology, good roads, fresh water, electricity and comfortable housing. But it must retain its natural appeal, by continuing to blend with the landscape as it does today. This will only be done if the rural population is taught to take pride in their environment from the earliest days. For all these reasons, therefore, nature education and conservation must be woven into our school curricula as soon as possible.

SOME SUGGESTIONS FOR PROMOTING EDUCATION IN NATURE CONSERVATION IN INDIA

By
P. D. TRACEY

Preliminary remarks

In any consideration of measures for promoting more understanding of the need for nature conservation in a country like India it goes without saying that the general level of literacy and of education has first to be taken into account. This, as most people are aware, is very low. Therefore it is probably correct to conclude that audio-visual types of education, propaganda and publicity have to take precedence over the merely literary types. However, the latter type which will cater for the educated, cannot be neglected. The second consideration is at what levels and in which spheres the two types can be most effectively directed. The third consideration is the securing of the necessary ways and means for carrying out an adequate programme in a poor country such as this.

Review of the existing position

In India today there is a pathetically low level of nature conservation aids. The subject is practically absent in schools, except a few of the public schools; there is a great dearth of the suitable type of educational and projection material; there is practically no literature on the subject and newspapers and journals, with the exception of a few, are lukewarm on the question. The organisations for the putting out of the message of wild life and nature conservation are to be numbered on the fingers of one hand. Until recently there were no incentives for the necessary study and surveys required for the building up of an adequate repository of knowledge on India's wild life suitable for basing education, publicity and propaganda material.

Suggestions for action

1. *Types of material suitable for India:* Attention should be focussed on audio-visual material suitable for the masses as well as for the literate. For the former, pictorial illustrations of India's wild life suitable for schools, and in particular rural schools, described in the various regional languages are needed. Examples are wall atlases, maps and charts of all kinds. Also, simply written books with authentic illustrations in the form of pictures or line drawings are needed. These books should avoid 'preaching' and should aim at the softer feelings of the human being and at arousing the interest and curiosity of the young. Religious, historical, national and cultural approaches should be strongly emphasized regionwise. For the latter, more scientifically based material is necessary. Projection material suitable for lectures and talks, such as film strips and slides, should be made freely available at low prices. Suitable model lectures and talks should be prepared to go with the more ambitious projection material; for the simpler material scripts should accompany them. The basic preparatory work will have to be done by educational and conservation societies, departments and universities and then handed over to commercial producers for bringing out on mass scale. Games based on wild life topics and with the necessary slant of conservation may similarly be produced.

2. *Methods of Conservation Education:* This should be largely directed at the young. School curricula should devote a part of the time to nature and wild life conservation education. Text-books suitable for schools should be prepared. Examples should as far as possible be taken from Indian and regional backgrounds. The use of the regional languages will, of course, be obligatory but books for the more advanced stages could with advantage be in English. For the adult greater use of the media of newspapers, journals and the radio and cinema are needed. The harnessing of television to the task will be important. Ways and means must be found to bring about a much greater production of literature on wild life. The opportunities afforded by zoos and natural history museums to achieve mass education of the large numbers of people who flock to such centres should not be lost.

UNIVERSITY EDUCATION AND TRAINING IN NATURE CONSERVATION IN INDIA

By

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It is not my intention to present the problems relating to conservation of Nature or to dwell upon the methods and techniques employed in this connection. Information relating to the varied aspects of conservation is easily obtainable from the numerous publications from all over the world.

In this paper on conservation and education I shall confine myself to the academic problems involved in training for conservation programmes.

During the last few years we have been seriously concerned about the shortcomings in the methods employed in our universities to develop creativity in young students of science. The ideas presented in this paper have been developed and tested at Delhi University and deserve the attention of science educators all over the country.

The development of spirit of inquiry

Every object in the environment around us is sending out, as it were, stimuli to which most of us hardly ever respond due to force of habit. To cite one example, how many of us ever asked the question why the bud in the axil of a leaf was dormant when we noticed it and what factors trigger the stimulus for growth if and when the bud started growing.

Every plant, every stone, every animal and every other phenomenon around us is full of challenges. Most of us have shut off our perception of stimuli from the environment that surrounds us. Science courses should be designed with a view to train students to identify and investigate the environment till this habit becomes a part of normal behaviour pattern. Every effort should be made to develop the young minds of students to constantly ask questions relating to observations they make in their environment and to suggest ways and means of providing answers to the questions. This should be the primary goal of science education programmes.

The existing programmes in science education in India have failed to achieve these objectives. Students have failed to develop, due to faulty training, an attitude of inquiry as is evident from their inability to respond to problems relating to their environment posed to them from time to time.

A group of biology students were taken to the bank of river Jumna (Delhi) one evening. A flock of ducks consisting of about a hundred birds were swimming at random over the river. Slowly they formed themselves into a compact mass of birds over the water and then suddenly took to flight. In a few seconds the birds were circling over water; they circled twice over water and flew away in a westerly direction.

The students who were watching the behaviour of ducks were asked to comment on what they observed. Their comments were either in the nature of an aesthetic appreciation of the event or were mere descriptions of what they had actually observed.

The behaviour of the flock raises a number of questions to be answered. Some of these are :

- (a) What was the significance of the birds in coming close together to form a compact mass prior to their flight ?
- (b) Where the individual birds 'aware' that they were migrating in a westerly direction while they were forming into a compact mass ?
- (c) How and by whom the 'decision' to fly in a westerly direction was taken ? Was this information communicated to the individual members of the flock or were the flock merely following the leader ?
- (d) Why was twilight chosen by the ducks for the migration ?
- (e) What factors triggered the stimulus to leave water ?
- (f) What was the significance of the flock circling over water prior to migration ?

More examples of the failure of our educational system can be cited. During the past several years groups of students have been taken out on field trips either to a sea-shore or, to a hill station. Among the many casual comments the students make one comment usually relates to cold weather in high altitudes. Neither the person who makes this comment nor any one listening to him ever had the curiosity to go a step further and wonder and ask the question why high altitude stations are so cold.

The intensive course in biology which these students had received had not stimulated their minds to identify even a *single* problem in biology and hence constitutes not only a total failure as a training process in science but as total failure also in terms of other broader objectives of education. Training for a biologist should aim at the development of an attitude of investigation inside classroom and outside with a view not only to add new knowledge but also to reform and refine existing knowledge.

The Concept of Conservation

Preservation of 'Wild Life' is only one aspect of conservation. School, College and University courses should demonstrate the checks and balances that operate in various ecosystems with a view to enable every single citizen to contribute to the success of conservation movement. A number of laboratory and field exercises can be designed to illustrate the balances and shifts operating in ecosystems in nature. A few random examples are given below.

While visiting one of the public schools in Rajasthan we were shown around a hill in the vicinity of the school that has been laid barren by extensive grazing by goats in recent years. Large scale erosion and landslides have also occurred as a consequence. We were glad to note that a group of students have undertaken a study of this hill as a project work.

Recently we discovered that the grass in the foot-path on a lawn undergoes striking modifications in response to trampling by man and cattle. The grass in the foot-path grows prostrate

and develops very short branches, leaves and internodes. Also, other species of grass growing on the sides of the foot-path are not found on the foot-path. It would be worthwhile to analyse this phenomenon. Investigations by students of this kind will contribute to an understanding of the interaction of complex factors that continuously shape our biological and inanimate environment.

A very striking way to develop concepts in interactions of environmental components is through a series of aquaria, each having a variable introduced as a part of the experimental design. Students obtain and analyse data from this project and develop concepts relating to ecosystems.

Experiments can be designed in college and university laboratories to investigate the effect of releasing polluting agents in the environment.

Photosynthesis by plants is taught in universities in terms of a few traditional academic factors like intensity and nature of light and carbon dioxide concentration. It will be more relevant to study the effect on the photosynthetic activity consequent on the introduction in the environment of such factors as smoke, pesticides, insecticides and other polluting agents resulting from activities of man.

It is not my intention to develop here a laboratory manual on conservation but merely to draw your attention to the fact that we can educate our students in the basic concepts in conservation of Nature without altering the structure of existing courses in biology, geology, chemistry and physics. Existing laboratory and field exercises can be redesigned to achieve this purpose. An experimental set up designed to investigate the rate of metabolism of a fish in a pond can also be made to provide us with information relating to the factors that alter this rate and consequently the ecosystem.

In recent years Summer Institutes in Biology have introduced simple methods by which students survey plant assemblages in a given area and prepare a graphic picture of vegetation on a structural basis. Compilation of this information over a period of years will give the student an understanding and appreciation of interaction of physical and biotic components of the environment.

It should be possible for schools, colleges and universities in this country to develop in students of science the need to manipulate and conserve nature around us. Tackling the problem of conservation through education of the citizens will be far more effective than governmental efforts through its various agencies.

Teaching and training for conservation in India

The primary responsibility for training in conservation will be with the biology departments in the colleges and universities in co-operation with departments of chemistry, physics, earth sciences and even meteorology. However, at the present time many biology departments in India are poorly equipped for this task. It is only in very few universities that plant and animal ecology courses are offered. The situation is particularly unsatisfactory with regard to instruction in animal ecology. A big handicap in the programme is the absence of field station facilities in Indian universities. There is also an urgent need for greater co-operation in drawing up of syllabi and co-ordination of instruction between Botany and Zoology departments, in such areas like ecology. In spite of these handicaps it should be possible to orient biology instruction towards our objective.

Biology education in our country is exclusively treated at an academic level without any relevance to the biological and socio-economic factors of the region where the student lives. It would be more profitable if biology education is given a regional flavour. The biotic environment of a student in Kashmir is very different from that obtained in Kerala or Rajasthan. The regional approach to biology teaching will to a great extent lead to an appreciation of the need for conservation practices.

Universities have another important role to play. All basic research relating to problems in conservation should be assigned to the universities which have the facilities and necessary expertise. Such universities should also offer courses in conservation. The problem of providing the students with general field experience can be solved by attaching the students for a period of two or three months with the regional conservator of forests.

The creation of departments of Nature conservation at State level will provide incentives for students to offer these courses. These departments will also bring about liaison between universities and Government agencies. Forests being Government property there is hardly any dialogue between universities and the Government. The departments of Nature conservation organised on the lines of U. S. Board of Wild Life and Fisheries can work in collaboration with the universities, the CSIR and the Government. This situation will give a great impetus for the spread of conservation movement in the country.

FORESTRY EDUCATION—PRIMO GENITOR OF NATURE CONSERVATION CONCEPT

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Forestry Science and formal forestry education radiated to all over Europe, India, the United States of America, Canada and Australia from France and Germany. Science of forestry commenced in the latter half of the 17th century in these countries and towards the end of 18th century forestry education curricula were fairly well developed. The term forest conservancy came to be used right from the beginning. Forestry education developed more or less uniformly in all the countries having an old history and tradition of scientific forest management, evolving along the same lines whether in the universities or as a part of forest management organisation. Forestry education curricula represent the most comprehensive nature and natural resource conservation courses aiming at imparting professional knowledge to secure production and services for human welfare, in perpetuity from the land resource managed as forests.

The process of professional forestry education consists of not only systematic transmitting of accumulated knowledge but also involves a continuous process of thinking and theorising leading to fresh observations, investigations and research, and thereby accumulation of new knowledge. Naturally at the commencement forestry education curricula in France and Germany were based on the knowledge gathered by forest silviculturists for over a century.

The origin of scientific forestry was based on the knowledge of the differences in forest vegetation and of the factors influencing the growth and natural distribution of forests. The property of self-renewability of forest resources was clearly understood right from the beginning and it was not taken for granted. Based on the collection of information through constant observations and systematic record, as early as in 1767, Enderlin in Germany published a treatise on the characteristics of forest trees and of forest soils in which he described the nourishment of trees and the factors of growth. Silviculture formed the basis of scientific forestry. Silviculture is the science and art of so harvesting the forest crops as to ensure regeneration including tending the crop to maturity, thus maintaining characteristic of the renewability. Pretty soon the empiricism was replaced by a sound scientific foundation and, early in the 19th century the underlying fundamental sciences such as Biology, Physiology, Geology, Meteorology, Physics and Chemistry etc. were applied to achieve a firm scientific base. Knowledge so gained was used in the classification of forest vegetation and in differentiation of forest types.

By 1852 a comprehensive analysis of the site factors operating in a forest was published by G. Heyer, leading to development of the theory of tolerance upon which silvicultural practice has evolved and progressed. Maintenance and improvement of the site continues to be the fundamental concept in silviculture. By the time the biologists took their investigations of the relationship of plants to their environments from the laboratory to the field, the silviculturists had already accumulated practical knowledge systematically collected over a century of field work.

Even instrumentation was employed by the foresters in studying the influence of forest upon the factors of locality individually and reacting with each other. Physical and chemical analysis of forest soils were made. Sample plots corresponding to 'quadrats' and line surveys now called 'transects' by the ecologists, were laid out for continued observation and record to study the origin and development of forest vegetation.

Plant ecology as a branch of botany came to be defined in a very general way as late as in 1886 by Haeckel as the science that treated the reciprocal relations of organisms and the external world. Formal forestry education commenced in the beginning of the 18th century and when the science of ecology had just started developing, scientific forestry education was fully established. Silviculture then and even now goes beyond the scope of ecology.

Education in the science and technology of forestry involves a sound understanding of the basic biological and physical sciences and general knowledge of humanities. Where professional forestry education commences after high school education, apart from ensuring a sound base in biological and physical sciences, considerable emphasis is laid on the study of the humanities. Where the forestry courses commence after general education in science upto the bachelor's degree level, graduates who had studied both biological and physical sciences at different 'levels of university education and some mathematics are considered suitable to pursue the professional course in forestry education. Rarely this complete combination of pre-requisites is not insisted upon particularly in relation to mathematics when the curricula are so developed as to provide the necessary knowledge in mathematics to enable building up of a sound professional and technological proficiency aimed at by professional forestry education.

The forestry curricula, although basically the same all over, differ in approach regarding the degree of specialisation in the initial stage. But essentially, apart from specialisation, the basic studies in the science and technology of forestry involve a study of the fundamental sciences of botany, zoology, geology and chemistry and their applied aspects and the study of silvics, silviculture, protection, silviculture of species, silvicultural systems and forest mensuration. Study of the application of economics to all this biological complex and organising the forest estate to meet the objects of forest policy, comprises the field of forest management. Forest policy and law form part of forest management curricula. In addition, allied subjects of land surveying and forest engineering complete the comprehensive scope of professional forestry education.

The related fields of soil and water conservation and wild life conservation have been included in the forestry education curricula during the last two decades or so, making the professional forestry education a comprehensive education in the management of land resource in accordance with the natural principles of land use. The professionally trained foresters possess the necessary foundation to travel out of the profession of forestry and work in the related fields of soil and water conservation and wild life management. Naturally these related fields are part and parcel of the practice of forestry on forest lands.

The concept of conservation of nature and natural resources based on the scientific understanding of all the factors of environment is not an abstract idea. That is why the word 'preservation' has given place to the term 'conservation'. The implication is that the natural environment and natural resources and their properties should be maintained and improved while in use. Conservation concept should be woven into the professional education dealing with land utilisation and management of natural resources, much in the same way as in the case of forestry education. Socio-economic factors are so powerful that these cannot be ignored easily. The experiences of the forestry profession embodied in forestry education courses provide a pragmatic approach to achieve success in making the conservation concept a movement to become part and parcel of the thinking of the people to be followed instinctively. In this sense forestry education continues to play the role of primo-genitor of the concept and practice of nature conservation.