

international environmental donor, can currently buy one US dollar of Costa Rica's debt for 25 cents from international banks that are eager to recoup losses. The *Costa Rican Central Bank has agreed to pay 75 cents on the dollar for debt notes* (in Costa Rican currency)—if—the money is put into conservation projects. Thus, the donor stands to get triple the value of his investment, and Costa Rica buys back some of its debt—at the same time keeping the money in the country.

Another 'debt for trees' agreement was recently reached in Bolivia, where the government agreed to establish three conservation areas totalling 3.7 million acres (approx. 1.7 million hectares) in exchange for notes of US \$650,000 face-value purchased by Conservation International, an organization based in Washington, DC.

The Central Bank of Costa Rica recently approved the proposed 'debt for conservation plan'. According to Dr Umana, one of the first projects to use the plan may be the proposed Guanacaste National Park. The Minister is currently working with WWF and Conservation International to raise one million US dollars, in order to purchase more than three million dollars' worth of debt and apply it to conservation in Guanacaste and other areas. This, however

does not end the problems. 'The impact of the plan on overall debt is small', says Umana. 'This is not a way to pay the entire debt of the third world; instead, it is a way to help conservation, not only for Costa Rica, but for all the world.'

This method of relieving debt and aiding conservation was discussed at the 17th General Assembly of the International Union for Conservation of Nature and Natural Resources (IUCN), in San José, Costa Rica, 1–10 February 1988.* More than 500 natural resource managers from around the world attended to discuss conservation issues and develop new approaches—*inter alia* to such issues as this 'debt for conservation'.

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* See the account in a forthcoming instalment of our Conferences & Meetings section.—Ed.

An Opportunity for Poster Designers, Publishers, and Enthusiasts

Posters, or wall-charts, are used very frequently and widely nowadays to inform the general public about coming events, or to focus attention on various topics and issues. 'Ecoposters' are used so to disseminate conservation messages, and to inform and educate the public in awareness of Nature, wildlife, and environmental issues.

The fourth triennial exhibition of Ecoposters was opened to the public in Czechoslovakia during November 25 1987 to January 31 1988, in the town of Zilina, in northwestern Slovakia. During those several weeks visitors could admire the artistic spirit, creativeness, interpretation of conservation, and ecological messages, that were displayed. Interesting also was the selection of topics, and the quality of the print representing different aesthetic and other criteria.

There were more than 200 posters displayed, most of them being of Slovak or Czech origin. But the organizers received and exposed posters also from no fewer than 22 other countries, including USSR, Hungary, Bulgaria, Yugoslavia, Poland, German DR, FR of Germany, Denmark, Sweden, Finland, United Kingdom, France, Liechtenstein, Luxembourg, Austria, Japan, USA, Canada, Honduras, and Brazil.

The exhibition was accompanied by a competition for those designers, authors, or publishers, who were represented by posters at it. The committee of organizers judged all the posters that were received and exhibited and decided to recognize some selected ones by giving them awards.

The next, fifth, triennial exhibit of Ecoposters (or *Eko-plagát*, as they are called in Czechoslovakia), will be opened in November 1990. So, do not hesitate to participate there with samples of your own posters. Your intention to contribute to the next exhibition and secure space should be notified preliminarily to the undersigned, address given below. Then you can expect further instructions on a printed leaflet. And, if you would like to arrange a similar exhibit of those well-proved means of conservational and environmental education in your own country or region, you can ask at the same address for some Ecoposters from Czechoslovakia on loan or exchange.

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'INSONA Conservation Award' for Environmental Achievement*

Under its Patron-in-Chief HH Fatehsingh P. Gaekwad, the Indian Society of Naturalists (INSONA), with headquarters in Baroda, India, has instituted an Environmental Awareness Fund to honour a schoolchild every year for outstanding achievement in the field of environment. Nominations are accordingly invited (names and descriptions of their work) for the 'INSONA Conservation Award' of 1988 for environmental achievement, to reach the General Secretary at Baroda not later than 5th June 1988. No child should nominate himself/herself, but his/her institution must do so on his/her behalf.

The award being established to extend INSONA's tributes to endeavours/successes achieved in the service of the global environmental cause, the recipient each year will be presented with Rupees one thousand in cash and a memento. The recipients shall ultimately become an integral part of INSONA's cause for human well-being through

* Although this award was evidently intended for the school children of India, it seemed such an excellent idea that we are now happy to be able to announce that it is to be available henceforth to schoolchildren of all nations.—Ed.

environmental conservation. There shall be a Jury to decide upon the Award, who shall recognize efforts in protecting, improving, and sustaining, our natural resources and environmental heritage.

The schoolchildren who devotedly strive, year in and year out, to preserve and enhance the environmental heritage which forms our life-support system, deserve the gratitude, appreciation, and encouragement of the Society. Those children by their nature do not aim at a reward; but

INSONA believes that, by so drawing attention to their accomplishments, many more children will be inspired to serve the environmental cause.

G.M. OZA, FLS, *General Secretary of INSONA*
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Indumati Mahal
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CFC Responsibility Claimed for Stratospheric Ozone Depletion*

A NASA-WMO sponsored study concludes that (1) ozone has measurably decreased between 1969 and 1986 in mid- and high-latitudes of the northern hemisphere, and (2) the CFCs are most probably responsible for the Antarctic ozone 'hole'. Ozone in the Earth's atmosphere, especially the 'ozone layer' or shield high in the stratosphere, protects Man and other living things from damaging amounts of ultraviolet radiation from the Sun. Such radiation in excessive amounts causes skin-cancer in humans and can have very serious adverse effects on plants and animals.

In 1985, large unanticipated spring-time ozone losses over Antarctica during the previous decade were reported for the first time in the British journal *Nature* (London). Since then the compelling scientific questions have been:

- A. Have these losses persisted?
- B. What is their cause?
- C. Is such depletion happening elsewhere on the globe?

In October 1986, an intense scientific effort was started, led by NASA, with the sponsorship of WMO and participation by UNEP and several US Government agencies, to address these questions. Over one-hundred scientists from ten countries formed study-groups, carefully analysing available data and critically debating possible sources of errors in the measurements. A series of computer calculations was also performed to aid in the interpretation of the results of the analyses.

Long-term records, some of which date back to 1957,† used in the effort, have been collected by WMO through its Global Ozone Observing System. Satellite observations since 1978 were also used extensively in the study. The scientists' answers to the three questions are that:

- A. The annual spring-time stratospheric ozone depletion over in the Antarctic has persisted and deepened;
- B. The probable cause of the Antarctic ozone hole is Man-made chlorine pollutants especially chlorofluorocarbons (CFCs); and
- C. Long-term data records show ozone decrease in the mid- and high-latitudes of the northern hemisphere.

The key findings of the study are given in the following sixteen numbered paragraphs:

Source and Trace Gases

1) There is undisputed observational evidence that the atmospheric concentrations of source-gases which are important in controlling stratospheric ozone levels (chlorofluorocarbons, halons, methane, nitrous oxide, and carbon dioxide) continue to increase on a global scale because of human activities.

* Based on the Executive Summary of the International Ozone Trends Panel.—Ed.

† and even, we have long understood, to the 1920s at Oxford, England, and soon thereafter at Arosa, Switzerland.—Ed.

Global Ozone

2) Calculations using two-dimensional photochemical models predict that increasing atmospheric concentrations of trace-gases could have caused a small decrease in ozone globally between 1969 and 1986. Predicted decreases between 30 and 60 degrees latitude in the northern hemisphere for this period ranged from 0.5 to 1.0% in summer, and 0.8 to 2.0% in winter, with the range reflecting the results from most models.

3) Analysis of data from ground-based Dobson instruments, after allowing for the effects of natural geophysical variability (solar cycle and quasi-biennial oscillations), shows measurable decreases from 1969 to 1986 in the annual average of total-column ozone, ranging from 1.7 to 3.0% at latitudes between 30 and 80 degrees in the northern hemisphere. The decreases are most pronounced, and ranged from 2.3 to 6.2%, during the winter months (averaged for December through March, both inclusive). Dobson data are not adequate to determine total-column ozone changes in the tropics, subtropics, or southern hemisphere outside Antarctica.

4) The model calculations are broadly consistent with the observed changes in column ozone, except that the mean values of the observed decreases at mid- and high-latitudes in winter are larger than the mean values of the predicted decreases. The observed changes may be due, wholly or in part, to the increased atmospheric abundance of trace-gases—primarily chlorofluorocarbons (CFCs).

5) Satellite instruments on Nimbus 7 (Solar Backscattered Ultraviolet [SBUV] and Total Ozone Mapping Spectrometer [TOMS]) have provided continuous global records of total-column ozone since October 1978. Unfortunately they suffer from instrumental degradation of the diffuser plate, the rate of which cannot be uniquely determined. Thus the satellite data archived as of 1987 cannot be used alone to derive reliable trends in global ozone.

6) The SBUV and TOMS satellite data have been normalized by comparison with nearly coincident ground-based Dobson measurements in the northern hemisphere. The resulting column ozone data, averaged between 53 degrees South and 53 degrees North latitudes, show a decrease of about 2.5% from October 1978 to October 1985. This period is approximately coincident with the decrease in solar activity from the maximum to the minimum in the sunspot cycle.

7) Theoretical calculations predict that the total-column ozone would decrease from solar maximum to solar minimum by an amount varying between 0.7 and 2%, depending upon the model assumed for solar ultraviolet variability. Thus, the observed decrease in ozone from the satellite data between late 1978 and late 1985 is predicted to have a significant contribution from the decrease in solar activity during this period.

8) Theoretical calculations predict that local ozone concentrations near 40 km altitude should have decreased

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