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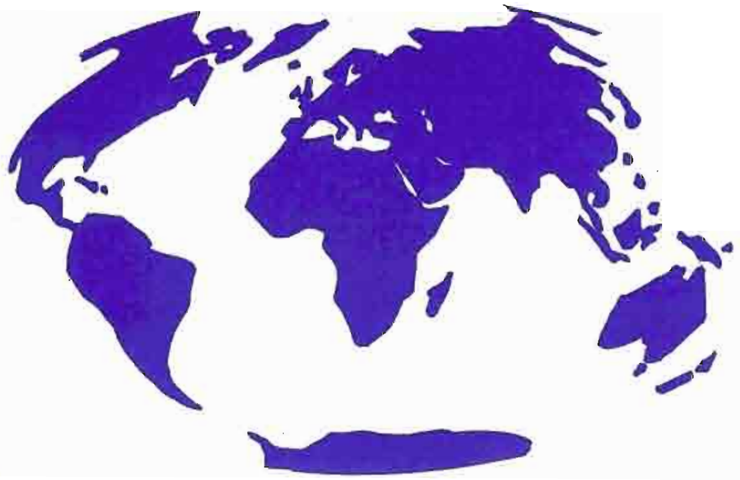

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EDITORIAL

During the past fifty years the revolution in biology has provided insight into many mysteries of the life processes. It is beyond doubt that this expanding revolution will continue to broaden our biological knowledge in the coming decades, and even newer discoveries will be increasingly important for the future of man. As well as its theoretical significance the new biology has both practical and general application : through the medical, agricultural and other sciences its effects are felt in everyday life. Moreover, we must recognize the essential role that knowledge plays in the attempt to preserve and protect a healthy human environment.

The results of biological research belong not only to the international scientific community but, through their beneficial impact, to the whole of mankind. Since the demand for international dissemination of biological knowledge raises ethical questions, biologists have a moral responsibility that transcends states, regions, and continents.

The IUBS considers it its task to promote the accumulation and reciprocal exchange of new knowledge through the establishment of connections between biologists living and working in different countries. The central scientific programmes initiated and organized by the IUBS serve this purpose. These activities, like those of affiliated scientific organizations, have participants from many countries.

The 23rd General Assembly held in Canberra emphasized and reinforced these principal aims of the Union. Furthermore, in order to increase and regularize the frequency of collaboration and communication between the Ordinary (national) members, it expressed the desire to include even more IUBS member countries as active participants in the central programmes.

Direct participation and more active cooperation in the scientific programmes will strengthen the institutional basis of the Union and possibly attract countries not yet belonging to the IUBS. We are convinced that greater cooperation between the biologists of the world will increase human understanding and, furthermore, enhance the recognition of common interests lying beyond the scope of biological studies.

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How Can IUBS Face the Challenges of the 21st Century

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Presidential Address at the 23rd IUBS General Assembly

We live in a world made dangerous by the threat of disease, war, famine, and accidents. However, life in this planet has always been dangerous. The universe of our parents and grandparents, and of their ancestors was filled with life-threatening situations. And they, like us, tried to lessen the dangers and make the world more safe for themselves, their children, and their society. And they were quite successful as life expectancy has increased quite dramatically all over the world in the last 100 years.

What made the world so dangerous for our ancestors was primarily the combined threats of disease and famine. An additional danger was warfare — violence perpetrated by one tribe, people, or country against the members of another. Life expectancy has improved largely because we have reduced dramatically the effects of disease and famine. We have not been so succesful in controlling mortality due to war.

We biologists can take credit for reducing disease and increasing food supplies since it was the employment of scientific biological knowledge to understand the workings of bacteria and later viruses, as well as the mastery of the physiology and genetics of crops that has reduced child and infant mortality, eliminated certain diseases, and made others less virulent, and increased food supplies world-wide. And the implementation of such knowledge around the globe in the next hundred years, and the advances in bioingeneering and new agricultural techniques, should increase life expectancy even more.

But still the world is not safe. The problems is that while we have reduced certain hazards we are facing new ones. And the new perils which are largely of our own making are more difficult to neutralize because of their nature and above all because of their scale. Paradoxically most of these dangers are also the result of the application of science and technology to the improvement of living standards. What are some of these dangers ?

In the first place there is the problem of nuclear war and nuclear annihilation. This is clearly the most acute danger we face since as was so dramatically demonstrated by the ICSU study on nuclear war, there are a number of primary and secondary effects of such magnitude that they can eliminate much of life on this planet, and certainly much of human life. Nuclear war is a danger entirely of our own making. Nuclear explosions and nuclear weapons do not occur naturally. It took some of the best minds in this world, from Rutherford, Einstein and Bohr, to Lawrence, Fermi, and Oppenheimer, fifty years to develop the theory of nuclear physics, and then it took a large part of the resources of the United States and the Soviet Union to develop a nuclear bomb. But now we have these weapons, and the number of countries with these dangerous mechanisms keeps increasing.

But although nuclear war is the most acute danger we are faced with it is not necessarily the most serious. In my opinion the changes that are taking place in the environment are potentially more dangerous to our well being than nuclear war. I am referring to changes in atmospheric chemistry such as the increase in "greenhouse" gases and changes in ozone concentrations in the lower and upper atmosphere; to the accumulation of chemical wastes on land and water; and to the growth of pesticide, herbicide, and other poisonous residues in the ecosystem including plant and animal tissues. Throughout all of its history mankind has had to contend with drastic environmental changes. Let us not forget that *Homo sapiens* withstood ice ages and interglacials. No doubt our ancestors that had only their memory to go by, were only vaguely aware of these changes. Thanks to our scientific prowess we are able today to evaluate what went on over the long term better than the people who lived through them. We therefore know that although the range of climatic and resulting environmental change that took place were massive, the rate of change over time was relatively modest.

The effect of greenhouse gases is to trap more energy in the earth atmosphere than is normally the case, with a resultant increase in the average temperature of the atmosphere. The mean value of solar energy reaching the earth surface is at present 240 W/m^2. In any year we can expect between 0.3 and 2.5 W/m^2 over or below 240.

On a time scale of a decade or longer, these variations even out and are unlikely to exceed 1 W/m² per decade. Increases in greenhouse gases are only serious if many such changes of the same sign are added together, which is exactly what is happening. It has been calculated (Dickinson 1987) that by the year 2100 the total amount of CO_2 in the atmosphere which is today 360 ppm will double to 720 ppm. Added to the effects of other trace gases with greenhouse effects, an average increase of 9 W/m² with a range of 3 to 15 W/m² is expected. The consequence of such a change is worldwide increase of between 2 and 10 degrees in average temperature, which represents from 20 % to 100 % of the temperature fluctuations experienced by the planet in the last 40000 years. A temperature increase of this magnitude could have drastic consequences, such as melting of polar ice caps, changes in sea level, and drastic changes in rainfall patterns.

This is not however the only environmental change which we are facing. The reduction by one half of tropospheric ozone by 2100 will have wide ranging health effects; likewise the increase in pollutants in the lower atmosphere. Furthermore the transformation of the landscape threatens the genetic diversity of our crops, their wild relatives, and that of naturally growing plants and animals, but not necessarily that of their predators and parasites. This could spell another kind of disaster : the routine loss of a great part of our crops. I could go on and detail these and other problems that we face. Let us also not forget that these events are occurring against a background of a large number of unresolved social and political controversies, such as the uneven distribution of income and power within and between nations. However I do not wish to catalogue here the ills of the world, not even those of an ecological nature. What I wish to do is to ask what role if any can IUBS play in their resolution.

Environmental problems are not new : human activities have always modified the landscape. In this our species is no different from any other. Humans are conspicuous only in the magnitude of the changes that they create and in the global nature of these changes. We also differ in our capacity to predict albeit imprecisely the effect of our behavior, and to take action to remedy any negative aftermath. This capacity has allowed us to restore degraded land, bring back fish and other wildlife to lands and streams once too polluted to support them such as the river Thames in Great Britain, and to reverse eutrophication in many lakes including some fairly large ones such as Lake Baikal in the Soviet Union or Lake Erie in the United States and Canada. We have been so successful in these enterprises that it can be said with some confidence that most environmental problems at the scale of a watershed or smaller can be resolved if there is enough political will and the necessary resources.

But the problems we are facing today are continental if not global in scale. They also involve time lags of decades to centuries. The ozone depletion in the troposphere is created primarily by industrial activity in the northern hemisphere but is felt most acutely in the southern hemisphere; fluorocarbons are one of the principal agents but by no means the only ones responsible for this change. If fluorocarbon production were to be entirely halted now, it will be at last fifty years before significant changes are noted in tropospheric ozone content. This is due to the fact that for a number of years after industrial fluorocarbon production is stopped, fluorocarbons in prior use will continue to be released into the atmosphere; and in part because of the large half-life of these compounds in the atmosphere. Greenhouse gases, especially CO_2 are even more insidious since they result largely from combustion of fossil fuels. It is very unlikely that humanity will — or can — reduce its dependence on fossil fuels soon. Consequently halting the increase of greenhouse gases must involve the creation of artificial CO_2 sinks, such as fast growing trees, or very sophisticated combustion apparatuses that somehow trap CO_2 in exhaust.

It must be evident that halting the release of CO_2 and other greenhouse gases into the atmosphere is a formidable technical, political, and economic problem. It will require the application of physical, chemical, and biological knowledge, including understanding these effects at every level from molecules to ecosystems; it will also require political will and international collaboration on a scale not yet experienced; and it will require lots of resources. If we go by past experience all indications are that not much will be done soon. However, if we do nothing and the worst predictions are realized, the resulting changes in coastlines and weather patterns could become so destabilizing that they could unleash even greater catastrophes, including nuclear war.

To solve global problems we need to have global objectives and global interests in minds. We also need institutions that can convey our concerns and from which the truly «global» interests can emanate. But most international institutions both governmental and non-governmental are not equipped to face the kind of complex and multifaceted problems which we are facing today, nor are they in a condition to deal with problems whose time scale exceeds by several orders the time horizons of concern of the political constituency that funds them. IUBS is one of these international institutions and we all know of the difficulties we have in funding our very small and modest scientific program, in spite of their worthwhile scientific contributions.

The first serious effort to develop an international program in the life sciences was the IBP, the International Biological Program. Originally a project of IUBS, the program was organized and run by ICSU. The original objective of the IBP was to assess and find ways to increase global productivity and human adaptability especially in third world countries. This objective was not realized but the IBP was to affect ecology and environmental sciences as no other effort before or since has. IBP's influence was both conceptual and sociological. On the conceptual side it demonstrated the validity of the notion that ecosystems are regulated by energy and material exchanges and that through the evolution of its component species, ecosystems have evolved some self-regulation. This notion changed ecology as a science. It was not originated within IBP, but it was successfully tested by the program. On the sociological side IBP and most international programs of that nature brought scientists with different backgrounds and experiences and from different countries together, and the experience was very positive. Ecologists accustomed for the most part to working alone learned to collaborate in order to answer questions that transcended the capacity of an individual or an individual research team to answer.

However, it is still true that new ideas in science are not produced by commitees but are the result of much effort, thought, and originality applied by individual minds. Large interdisciplinary efforts with their time consuming and energy sapping travel and interminable meetings, are not the best setting from which original ideas originate. Large international programs have also failed to attract young scientists. But if we are to successfully address global problems such as the increase in greenhouse gases we need to have both international cooperative efforts, and original ideas proposed by individual scientists; we will need the participation of experienced hands in the game of international science and the efforts and enthusiasm and originality of young scientists. And the effort must not only involve ecologists but the entire biological community. But if large international programs have a tendency to do "routine" rather than "front-line" science, and if the more imaginative scientists stay away from such efforts, then I can predict an unhealthy dichotomy.

ICSU has embarked into the largest research effort of its history, the IGBP, the International Geosphere-Biosphere program, a twenty year effort to learn how the Biosphere and the Atmosphere interact in an effort to measure and quantify the effects that human activity are having on the total environment. IGBP is being planned by a series of committees formed by some of the best physical and biological scientists in the field of environmental science. From the already published material it is clear that IGBP will be a large, well planned, and directed program. One that will address most of the important concerns regarding the environment to which I have alluded. It will gather a great deal of data and it will produce models on the function of the atmosphere, and the influence that the biota and humans have on it. Whether it will be able to produce new scientific insights is more doubtful for the reasons I have alluded.

Here is where IUBS and other Scientific Unions can play a role. Clearly as our experience with IBP showed, IUBS lacks the resources to run large, integrated, global-scale programs. These require the management skills and interdisciplinary base that only ICSU possesses in the non-governmental field. We can provide however the forum for the airing of new ideas and new concepts as the two successful conferences on Biological Complexity have shown, and in that way be complementary to the aims and objectives of IGBP. And it is by providing new and fresh ideas and concepts that IUBS can and should provide the leadership in solving some of the many serious and threatening problems that the world faces. And we represent all of biology, and not just the environmental sciences.

The scientific programs of IUBS already includes several initiatives that are complementary to the aims of IGBP, especially the four programs of the "Decade of the Tropics," and the Bio-Indicator program. In addition the sections and committees of IUBS, in particular the International Association for Ecology (INTECOL), have also supported efforts to define opportunities and objectives for IGBP. So, for example, INTECOL'S workshops on soil ecology, are especially relevant. So also are problems of measuring variation across landscapes and the technical problems of establishing ground truth of remote sensing observations. Other relevant areas are soil biology, cellular and organismic responses to pollutants, and the physiological and genetic mechanisms underlying these responses.

We in IUBS assume that individual biologists, and national and scientific members of IUBS will play a variety of roles in IGBP. However of the many possible topics of interest to IGBP that IUBS could explore I feel that none is more appropriate than the role played by biological diversity at all levels from molecules to organisms in ecosystem processes. I hope that we will be able to organize studies on the role of diversity of cells, life forms, species, and communities, that could contribute directly to the goals and objectives of IGBP, culminating in an international congress on biological diversity to take place in 1991 in conjunction with our next general assembly.

In conclusion, I feel that humankind is faced with a number of challenges such as it has never faced before. People everywhere are demanding a better life for themselves and their offspring. This implies more industrial development, more food production, more energy consumption. So far most countries have paid little attention to the environmental implications of industrial development. Clearly if that road is followed in the future the objective of improving the living standard of humans will not be realized, since the negative consequences of industrial pollution will outweigh the benefits of industrialization. A new way is needed, one that pays more attention to equitable distribution of wealth between nations and individuals, and less to consumerism.

Science, including Biology has done a great deal to lower human suffering and increase the quality of life. Unfortunatelly technology is not cost free, and we now are faced with serious environmental problems. To solve these problems we hope to develop new scientific insights that we hope will produce technological solutions. This raises an interesting philosophically enigma : will the solutions create new problems to be solved with more technological fixes ? Or will we eventually have to find the solution outside of science ? Only time will tell.

Bioindication of Biological After-Effects of the Chernobyl Atomic Power Station Accident in 1986-1987

by Profs. V.E. Sokolov, D.A. Krivolutzky, I.N. Ryabov, A.I. Taskaev, V.A. Shevchenko

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Assessment of the after-effects of ionizing radiation on animals and plants and the role of biota in further redistribution of radionuclides in terrestrial and aquatic ecosystems in the Chernobyl Atomic Power Station Region was started in May 1986. To coordinate these studies the integrated ecological programme "Effects of Radioactive Pollution on Flora and Fauna" was developed involving over 50 research institutes, largely biological.

The programme contains 6 sections :

(1) investigation of changes of flora and fauna under the effect of radioactive pollution;

(2) investigation on chronic action of small doses of ionizing radiations on the structure and functions of plants and animals;

(3) investigation of genetic after-effects of the accident on objects of flora and fauna;

(4) development of ecological prediction of pollution of objects of flora and fauna;

(5) development of theoretical concepts of the regularities of migration and transformation of radionuclides in ecosystems and their simulation;

(6) development of practical recommendations for the elimination of the ecological after-effects of the accident.

We are not concerned here with purely radiational aspects of studies that were presented in detail in the Report of the Soviet ecologists at the 14th Session of the Council of Managers of the UNEP in Nairobi, in 1987, (Izrael, Sokolovsky, Sokolov et al., 1987) and also in publications in the Soviet press (Information about the Chernobyl Atomic Power Station Accident and its After-Effects, 1986; Izrael et al., 1987).

Estimation of the Radioecological State and Genetic Effects on the Flora in the Radioaction Trace Region

On the basis of the initial data obtained as a result of the Programme's studies, there are reasons to conclude that of all the vegetative objects, the most sensitive to the radioactive pollution in the Chernobyl Atomic Power Station area were pine forests *(Pinus silvestris)*.

Lethal effects of pine irradiation with high radiation pollution levels (absorbed dose 8 to 10 krad) manifested themselves visually by late summer 1986 and during subsequent summer and winter season, and the area of the dead forest massif reached about 400 ha.

A sublethal dose (over 0.8 – 1 krad) killed some trees, mainly at an age of 10-12 years, and 90-95 % of young shoots were necrotized. The greatest morphological changes were recorded in areas with a mean level of radiation effect of about 0.3 to 0.4 krad. Most of the pines under study developed shortened and often curved top shoots, on which conifers were only partially retained. As the young shoots died, on the second year shoots lateral replacing buds mostly developed.

In the conifers that developed on anomalous shoots in the zone with sublethal and medium doses, mesophyl cells decline in size and accrescence of mechanical tissues was recorded. Mitochondria and chloroplasts proved the most sensitive organelles. Disturbance of the lamellar systems in the latter led to a disruption of the chlorophyll-protein-lipoid complex, which was accompanied with the conifers growing yellow. In the juvenile and mature plastides in these zones large numbers of plastoglobules were accumulated (up to 50-70 and over per section) and in the cytoplasm were formed numerous protein-lipoid bodies, 2-3 μ in diameter. The ultrastructure of the injured conifers testifies to a disturbance in them of protein and lipid metabolism, which manifests itself structurally in a disturbance of membrane systems of the cell organelles.

With respect to reproduction, a certain relationship appeared between the sexualization of the generative structures and their radioresistance. The greatest radiosensitivity was shown by male shoots, and the most resistant were the cones of the second year, which retained viability even in the zone with sublethal radiation level.

Leaved arboreous species, mainly represented in the Chernobyl Atomic Power Station Zone by birch, aspen and oak, practically did not suffer from pollution, since their radio-sensitivity was about 10 times higher than that of conifers. No visible morphological changes were revealed by herbaceous plants populating the polluted territories either.

To obtain express-estimates of the biological action of radioactive pollution on herbaceous plants and performance of "biological dosimetry" in a difficult radiation situation experiments were conducted with spiderwort Clone 02. In the period of June to August 1986 a daily estimate of the number of mutations induced by radioactive pollution was performed. In parallel were conducted analyses of mutation process in the spiderwort in control. For three different variants of the experiment the dosage rate for the gamma-background was 15, 5 and 0,3 mr/hr. The mutation rate, averaged for the June-July period was 1.1, 0.6 and 0.23 % respectively.

Thus, the level of mutation process in pollution (0.3 mr/hr) does not exceed the control. The dose rate being 5 and 15 mr/hr a genetic effect of radiation was observed that was significantly higher than the control level.

In addition to these studies an investigation was performed of the level mutation process in natural populations of *Arabidopsis thaliana* in natural populations widely distributed in the accident zone. The Arabidopsis seeds from natural populations growing on the polluted territory were sampled in late May 1986. After 3 months when the rest period in the seeds was over they were sown in a green house in 5 replicas, 36 seeds in each. A total of 10 samples from populations were analyzed, of which 2 were control. The dosage rate at sites where the seeds were selected was 240, 60,10,3, 0.3 and in the control 0.02 mr/hr. The germination rate and the rate of embryonic lethals in the second generation were determined. Dispersion analysis of the germination rate results showed the absence of differences for this index among the replicas (A) = 1.2; P_A 0.1 and statistically significant difference between the populations (B) = 8.0; P_B 0.001. There was no correlation between the dosage rate of the chronic irradiation and germination rate. The frequencies of embryonic lethals at 240 mr/hr were 12.2 %, at 60 mr/hr 81.1 % and in other cases it was practically similar, averaging 4.0 % without differing from the control significantly.

An estimation of the quality of seeds for 29 wild species belonging to 12 families was made. The main parameters were the mass of 1000 seeds, germinization energy and laboratory germination rate. It has been established that in seeds that were formed under conditions of dissimilar radiation background showed a depression for the paramaters mass of 1000 seeds and laboratory germination rate.

Based on the data obtained, a conclusion is made that plants in which inhibition manifests itself at a dose rate of up to 5 mr/hr are radiosensitive species : that to some degrees in the remaining species seeds are formed at a dosage rate of 80 mr/hr, and in some seed productivity also remained at 650 mr/hr. The latter seem to be characterized by comparatively high levels of natural radioresistance.

In the search for the most approriate plants for cytogenetic assaying in the area of the Chernobyl Atomic Power Station the attention was drawn to *Crepis tectorum*; this plant bears 4 pairs of large and well-differentiated chromosomes. It was employed for the cytogenetic studies of chromosome aberrations in the germinated seeds. Continous cholchicine treatment made it possible to distinguish clearly the metaphases of the first, second, third and all subsequent mitoses. These experiments which were carried out over a period of two years proved that the frequency of chromosome aberrations increases with the growth of the dose rate (more than 20.000 metaphases have been analysed); this increase was observed when a dose rate of 5 mr/hr was reached (as far as August, 1986 is concerned), which shows the high sensitivity of this plant.

The second year of exposure to chronic irradiation was characterized by the appearance of plants with a changed karyotype. These plants were homozygous for "the viable" aberrations, which could pass through "the sieve" of mitosis and meiosis. The appearance of plants with karyotypical alterations confirms the presence of active microevolutionary processes in chronically irradiated populations.

Thus, the results obtained in the experiments with *Arabidopsis* and *Crepis* show that they are convenient plants for biological dosimetry of radioactive contamination, especially in the case of complicated combinations of alpha-beta-and gamma-radiation sources. An analysis of the changes in the Karyotypes of plants exposed to chronic irradiation makes clear the role of the karyotype rearrangements in the genetic adaptation of the populations chronically exposed to ionizing radiation.

State and Genetic Effects in Representatives of Terrestrial Invertebrates

The study of the genetic effects of ionizing radiation on land invertebrate animals was carried out on three natural Drosophila populations located on the plots characterized by various levels of contamination. The flies were caught in July 1986 on the plots which were exposed to dose rates of 80,6 and 0.2 mr/hr. Prior to the experiments Drosophila populations were maintained in the laboratory on the standard medium over a period of two generations. The analysis of the level of the dominant lethals (DL) showed the highest incidence of DL to be characteristic of those populations from the areas with the highest radiation level : 14.7 ± 0.4, then 9.3 ± 0.3 and 6.2 ± 0.2; in the control population 4.3 ± 0.1.

Along with the examination of plant objects in the zone of Chernobyl accident, observations were made of animals belonging to different taxonomic groups. In radioactive fallout, the bulk of the fallout products are concentrated in the upper soil layer, and the animals populating this biogeocenotic layer find themselves in the zone of the most intensive action of ionizing radiation compared with other animals populating the given territory. Hence, the examination of the soil fauna is of much interest.

The censuses of soil microfauna and mesofauna in the forest and ploughland showed convincingly that the soil dweller populating the litter were badly affected by the radioactive pollution at the litter surface dosage rate of 7-15 mr/hr. The number of mass groups of soil mites and also the early stages of the development of animals representing mesofauna were reduced by about 30 times (as of mid-July, 1986). A considerably smaller (2-3-fold) was the reduction in the populations of mesofauna in the fields and in the deep layers of ploughland, not a single group of animals — they dwell essentially in the soil layer of 5 to 20 cm — showed a catastrophic drop in numbers.

Radioactive pollution disturbed the process of normal reproduction of some soil dwelling populations. Among microfauna the first instars of nymphs and larvae in the polluted area were totally lacking among the soil population of pine forests. In ploughland the mortality rates among young animals were lower, but the population of young earthworms were 4 times as low as in non-polluted plots. Since the dosage rates of soil fauna irradiations are determined, there are reasons to conclude that the absorption of a dose about 2.9 krads brought about catastrophic changes in microfauna communities, while doses of about 0.8 krad led to recordable but minor changes among the dwellers of the soil surface. In ploughsoils even at a total surface dose of about 4.0 krad, the animals in the soil depth were affected only to a small extent, apparently because they were well protected by the shielding layer of soil from the beta-rays.

Analysis of the life cycles of soil fauna has shown strong radiation effects in 1986 suffered by invertebrates, whose breeding or whose mating periods were in May-June, i.e. during 1-2 months after the accident. The main irradiation doses were determined by ^{131}I. Since the half-life period of this radionuclid is low (about 8.04 days), the irradiation rate rapidly declined and 4 months after the accident irradiation with ^{131}I was biologically insignificant. Presumably, for the same reason as early as autumn 1986 the process of recovery of soil microfauna began. In particular, larvae and nymphs appeared in soil mite populations. The process of recovery of soil fauna augmented constantly and by the autumn 1987 for all the main dynamic parameters (intensity of breeding, age-sex composition of the population) soil microfauna even in the most heavily polluted plots under study was comparable to the control.

The study of genetic effects caused by ionizing irradiation in terrestrial invertebrates was conducted in the natural populations of *Monochamus galloprovincialis pistor* dwelling on the fallen trees of pine. In the two experimental plots with dosage rates of 4 mr/hr and 40 mr/hr, the rates of their development did not differ, the larvae had no morphological deviations from the normal. Apparently, in the Chernobyl Atomic Power Station neigh-bourhood, a mass out-break of this primary pest on the weakened pine trees may be expected, and as a consequence, mass death of pine stands in the polluted area in 8-10 years.

Preliminary analysis of assymmetry of the variation in the wings of three Zygoptera species with a significance index of 0.99 revealed a higher level of assymmetry and disturbances of venation in areas with a dose power of 4 and 40 mr/hr compared with the control plots (0.2 mr/hr).

Lepidoptera of 10 genera collected in the experimental plots (Pteridae, Nymphalidae, Lycaenidae, Satyridae) showed no morpho-logical deviations from the norm which is perhaps explained by their high migratory activity and mobility.

State and Genetic Effects in Repre-sentatives of Terrestrial Vertebrates

The territory around the Chernobyl Atomic Power Station used to be heavily inhabited by people, ploughed up and widely used for recreation zones, so that the population and fauna of terrestrial vertebrates were relatively poor. In addition pine stands are not particularly rich in wild mammals, birds, amphibians or reptiles.

During the early period after the accident, no incidence of mortality, decline in fecundity or migration of vertebrates under the direct action of ionizing radiations was recorded. The numbers and distributions of animals developed to date were largely affected by the secondary ecological factors : death of the pine stand massif, evacuation of the people and hence elimination of disturbance factor, termination of cultivation of the soils, the crop of 1986 remaining standing, and evacuation of domestic livestock. These factors promoted survival of game animals and birds during the severe and snow-abundant winter of 1986-1987. No changes in the species composition were recorded.

Moreover, evacuation of human population, termination of hunting, made the territory attractive to many game commercially-important species and as early as the autumn of 1986 and winter 1987, moved into that zone fox, hare, deer, moose and wolf sps., from the adjacent areas in a radius of 50-60 km, and also commercially important waterfowl.

The most widely distributed and numerous mammals in the Chernobyl Atomic Power Station Area are murids represented by several species. Hence, in the populations of these animals were estimated the primary ecological, radiobiological and genetic effects as determined by ionizing irradiation. For that purpose the plots with a mean exposure dose rate as of October 1986 ranged from 0.04 to 400 mr/hr were selected.

The estimated values of the absorption dosage from the external gamma-irradiation for animals dwelling in the plots under study over the period of April to October 1986 (provided that half the time is spent by them outside the burrow) are : Plot 12 6000 R, 10-600 R, 9-600 R, 13 - 1.2 R, 11 - 0.6 R. The absorption dosage from the internal irradiation is about 10 times lower.

Comparison of the above-given absorption dosages of irradiation of murids with LD_{50} values, which varies for wild animals within the range of 600 to 1200 rad gives ground to predict mortality of animals in Plots 12, 10 and 9. The relationship between the numbers of the animals at these plots, in October 1986, and their numbers in similar habitats in control plots indicates that in Plot 12 after the accident about 90 % of all animals died and in Plots 9 and 10 about half of them. The observed increase in the numbers by spring 1987 occurred in these plots owing to migration from adjacent non polluted territories.

In September 1986 intensive breeding was observed in all the areas, which was largely accounted for by mature young of the same year. And, the animals from polluted plots showed an increased number of ovulating ova corresponding to the number of *corpora lutea* and determining the potential number of embryos. This increase was accompanied by a considerable embryonic mortality, which averaged 34 % for the bank vole *(Clethrienemys glareolus)* in October 1986. In the spring 1987 a decrease in the breed of animals due to embryonic mortality in polluted plots as compared with controls averaged 15 and was a function of the intensity of pollution and the species of animals under study. Still, the number of rodents in spring began to increase rapidly, in all plots.

When evaluating the genetic changes in the organisms of rodents it was shown that the frequency of chromosome disorders of all types under study was significantly higher in the animals from the polluted plots, as compared to the control. Noteworthy is the fact that while in the control animals all the discovered aberrations were represented in the fragments, in population with a dose rate of 0.5 mr/hr, the proportions of chromosome and chromatid aberrations (60 %) and polyploidy (40 %) were approximately equal. The genomic disorders in population with a dose rate of 5.0 mr/hr constitute about 13 %. These differences in the sets of the revealed disorders can be explained by varied radionuclid contents in the habitats of these populations.

An analysis of the genetic effect was carried out most thoroughly on the house mice *(Mus musculus)* caught on the three plots differing in the dose rates of the external irradiation : (1) 0.1-0.15 mr/hr, (2) 1-2 mr/hr, (3) 60-100 mr/hr. The animals did not show any signs of radiation sickness. All the male mice were mated with the females F_1(CBA × C57B1), and they were found fertile. The average size of the litter did not differ depending on the plot and constituted 8.5 young mice per female mouse. The study of the frequency of dominant lethal mutations (DLM) in the experimental male mice failed to reveal any differences among the animals from various plots. Analyses of the frequency of anomalous sperm heads (ASH) in the males also failed to reveal any dissimilarities.

The study of the frequency of reciprocal translocation (RT) has shown that the mice from the two contaminated plots (dose rates 1-2 mr/hr and 3-40 mr/hr) were found to have an increased RT frequency which amounted to 0.37 and 0.43 (the control 0.17). Currently, a study is being carried out on the inherited RT frequency, as well as on the radioresistance and incidence of tumors induced in animals of the first generation.

State and Genetic Effects in Representatives of Aquatic Flora and Fauna

Radioactive substances in the watershed area washed out into waterbodies where redistribution and accumulation of radionuclides occured basically in such components as bottom deposits, aquatic plants, hydrobionts. All that leads to an additional irradiation of both aquatic organisms and man who is associated with hydrosphere by a food chain. Of hydrobionts, the most radiosensitive link is represented by fish, whose commercially-important species are also the final link of the accumulation of radionuclids in the food chain from the aquatic system to man.

According to radioecological studies in 1986-1987 in the rivers Pripjat, Uzh, and in the Kiev Water Reservoir members of 7 families were analysed. Of particular interest were commercially-important fishes of the families Esocidae, Cyprinidae and Perxidae. In the Kiev Reservoir even in its northern part, the levels of activity are noticeably lower than in the rivers Uzh and Pripjat.

Eco-morphological investigations of the properties of breeding of fishes in the region of the accident revealed no deviation from the control regions. Morphological analyses of young in July-August 1987 revealed no anomalous individuals. As to the content of $^{137}Cs + {}^{134}Cs$ young fishes of this year of the most mass species can be arranged in a decreasing order of magnitude in the following way : *Carasius carassius, Scardinius erythrophthalmus, Perca fluviatillis, Abramis brama, Rutilus rutilus, Leuciscus leuciscus, Alburnus alburnus*. The fry of *A. alburnus* is polluted to a 2.5 times less extent compared with that of *C. carassius*. This distribution is explained by the properties of the ecology and feeding of the above mentioned species at the fry stage.

To determine the primary genetic effects of pollution in fishes dwelling in the cooler reservoir of the Chernobyl Atomic Power Station, the rates of cells with chromosome aberrations in the corneal epithelium of carp were estimated. The rates of cells with chromosome aberrations in the corneal epithelium of carp captured in the cooler reservoir and in the ponds at a distance of 60 km from Chernobyl were 8.1 and 3 % respectively. It implies that as of May 1987 mutagenesis in the carp population dweling in the cooler reservoir of Chernobyl Atomic Power Station did not increase.

Conclusions

To date a very brief prediction of ecological and genetic changes in irradiated ecosystems based on data in different countries over several decades is possible. It should be noted that doses in the accident region exceed natural population levels a good deal.

At lower doses of an order of 0.1 rad/day and over (about 40 R a year and over), investigators recorded some particular genetic effects (disturbances in the number and structure of chromosomes, various specific mutations of plants and animals, disturbances associated with changes in fertility, etc.), but even such levels do not result in any substantial genetic consequences for the irradiated natural communities. The process of ecological shifts associated with removal of sensitive species and re-arrangement of the structure in the irradiated species begins at higher dosage rates of chronic irradiation of 1 R/dav and over.

Analysis of primary-radiation genetic effects in a number of species of plants revealed no significant differences in the levels of mutation process for the bulk of the region, except some areas in the immediate vicinity of the atomic station, where pine stands are essentially affected. During the 1986-1987, the zone of irradiation disturbance of pine trees would gradually expand, since the time necessary for the manifestation of irradiation effects is a function of the absorbed dose of irradiation. It may be expected that by the end of 1988 the zone of affected pine stands would expand to the isoline corresponding to the initial dosage rate of gamma irradiation of 150 mr/hr.

The results of ecological studies of animals show that radioactive pollution in the nearest zone has affected the soil fauna, particularly the constant dwellers of the forest litter. The total exposure dosage of about 3 krad was obviously insufficient to cause a direct detrimental effect on soil dwellers, since it was 3-30 % LD_{50} for the majority of the groups of these animals. This dose was sufficient for providing the death of eggs and the early stages of development of nearly all invertebrates and the adverse effects of the pollution should be associated with disturbances in the process of breeding and regeneration of the population. In ploughsoils, deep soil dwellers were shielded from irradiation by the overlaying soil layers. No catastrophic death was recorded for any group of animals. A year after the accident a slow recovery of the soil fauna of the forest at the expense of the remaining forms (15 % of the control) was recorded as well as active population by insects from outside, the numbers of whose larvae practically equalled those of controls. Hence an outbreak of certain groups of insects can be expected. Primarily these might be the pests of fruit trees in leftover gardens where no usual measures for plant protection are taken. In addition, one may expect mass attack of irradiated stands by timber pests. To date, radiation-affected forest has not been populated by timber pests, since the reserve of complete population of the forest massif from the surrounding forest plots far from sufficient. For the bulk of the mass of terrestrial vertebrates no inhibitory action of ionizing radiation was recorded. Presumably, in the region of the forest that died some of the animals that are not mobile and have small home ranges died of ionizing radiation, but that can only be conjectured. In certain plots with an increased level of radiation were observed disturbances in the regeneration of offspring in murids. Nevertheless, the numbers of animals in these plots in the autumn 1986 did not differ from the controls. In spring 1987 in certain polluted biotopes, the number of rodents noticeably decreased, and then began to recover again rapidly.

As shown by preliminary estimates, the doses of irradiation of the majority of aquatic organisms in the Kiev Reservoir do not exceed the range of doses at which occur radiation injures of the populations. In the river Pripjat, the doses of irradiation of fishes are about 0.4-0.5 R/hr. Such doses cannot exert any negative effect on fishes or other dwellers of the waterbodies.

A considerable decrease in the anthropogenic factor on the fauna particularly on large animals and birds has resulted in considerable increase in their numbers in the regions that are close to the site of accident. An example is the appearance of the nests of the stork *Ciconia nigra*, a species recorded in the Red Data Book of the USSR.

The accidental outburst of the Chernobyl Atomic Power Station did not affect considerably the flora and the fauna of the region over a year but a full estimate of the action of radiation pollution necessitates long-term integrated radioecological monitoring.

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Late Quaternary Climatic Oscillations in the Venezuelan Andes.

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The highest part of the Venezuelan Andes was covered by extensive glaciers in the end of the Pleistocene (Mérida Glaciation) that formed high moraines and deep valleys down to 3000-35000 m elevation. At present glaciers are restricted to the highest peaks and the snowline is at about 4700 m elevation (Schubert 1974, 1984).

The palynological analyses at elevations between 3500-3700 m have shown that the glaciers have already retreated to higher elevations at 12650 B.P. and a superparamo vegetation started to establish at that time in the glacial valley of Mucubají (3500 m elevation). The vegetation was poor in number of species and scarcely distributed (Salgado-Labouriau, Schubert and Valastro 1977). The first plants to reach the valley were *Montia,* Gramineae and Compositae, followed by *Lycopodium* and Caryophyllaceae. The climate was dry and very cold; the average temperature was at least 2.9 °C. At present the average temperature is 5.3 °C with an absolute minimum of − 9 °C; and absolute maximum of + 22 °C, in 24 hour cycles; average precipitation is 1084 mm per year (Salgado-Labouriau 1984).

Between ca. 12250 and 11960 B.P. (interpolated ages) a short warm interval occurred; a paramo vegetation similar to the present covered Mucubají valleys and moraines, and the tree line was at about the same elevations of today. The Mucubají warm phase (Table I) is correlated with the Guantiva Interstidial of the Colombian Andes (González, van der Hammen and Flint, 1965). At ca. 11700 B.P. a cold phase started and continued until ca. 11000 B.P. when the stratigraphic section ends. This cold phase was locally humid and the average temperature was probably 2.4 °C below today's average (Salgado-Labouriau 1984).

The palynological information from a glacial circle in the paramo of Miranda at a higher elevation (3920 m) indicates that glaciers have retreated and a very scarce vegetation was growing over rocky soil at the region prior to 11470 B.P. and remained as so until 9360 B.P. (Rull 1985). The very cold climate during this interval at paramo of Miranda is correlated to the Mucubají cold-humid phase, and indicates it was a long interval that reached the beginning of the Holocene (Table I). The cold phase is also correlated with the Colombian Andes El Abra Stadial (González et al. 1965). During this time the newly deglaciated soils at elevations above 3900 m were slowly colonized by superparamo elements. The first plants to reach the site (Fig. 1) were Gramineae, Cyperaceae and *Montia*. They were followed by *Coespeletia* and a few other Compositae, *Lycopodium* and *Arenaria*.

At about 8300 B.P. the vegetation was abundant although many of the modern elements had not yet arrived at the paramo of Miranda (Fig. 1). From ca. 8300 B.P. to 6240 B.P. the altiandean paramos were covered by a vegetation which was not as rich as its modern vegetation. The tree line was at approximately the same elevation as today, and the average temperature rose to its modern value, indicating a new warm phase. At another paramo (La Culata) the same climatic and vegetational pattern was detected between 7530 and 6300 B.P. (Salgado-Labouriau and Schubert 1976). Later on, between 6250 and 6000 B.P. ;a cooler and dry phase occurred and is well delimited in the La Culata section (Table I).

Temperature and humidity started increasing after 5500 B.P. and the vegetational belts ascended and probably reached elevations higher than today. The maximum of this warm and humid oscillation occurred at 2500 ± 70 B.P. This interval (Miranda warm phase) was also observed at La Culata section.

From 1800 to 740 B.P. the vegetation and climate were again similar to present, although at the ecotone between paramo and cloud forest there was less Compositae than today (Salgado-Labouriau & Schubert 1977). This warm oscillation was detected at the paramo of Miranda (3920 m elevation) and Laguna Victoria (3250 m elevation) (Rull 1985, Salgado-Labouriau & Schubert 1977), and is contemporaneous to the Medieval Warm Period (Lamb 1965, Ladurie 1971, among others).

At about 700 B.P. (A.D. 1250) the abundance of pollen and spores decreased, the tree line begun to retreat to lower elevations and a new cold phase started. This phase (Table I) is well characterized at Piedras Blancas, 4080 m elevation (Rull 1985) at Laguna Victoria (Salgado-Labouriau & Schubert 1977, Rull et al., en preparation) and at Paramo of Miranda (Rull and occurred at approximately the same time as the Little Ice Age (Lamb 1965, Ladurie 1971, among others). Nevertheless, from 340 B.P. (A.D. 1610) onwards the pollen assemblages at the ecotone paramo-cloud forest (Laguna Victoria section) show men's intense use of the land and the beginning of the cultivation of wheat and cattle-raising in the Venezuelan Andes.

In summary, the pollen analysis of five sites in the Venezuelan Andes detected three cold phases after the retreat of the Mérida glaciation. The phases were intercalated by warm intervals of which the last had its maximum at 2500 B.P. (A.D. 550) and reached an average temperature higher than today.

Table I. Late Quaternary climatic oscillations in the Méridas Andes

Years Before Present (B.P.)		Vegetation and Climate at 3500-4080 m elevation.
Interval (interpolated ages)	Radiocarbon dates	
180 to 340	260 ± 70	Man's disturbance of the ecosystems. Piedras Blancas cold phase (PB, LV).
380 to 700		Depression of the tree line and paramo belt, very scarce vegetation in the superparamos. Piedras Blancas cold phase (PB, LV).
740 to 1800	1220 ± 80	Vegetation and climate similar to present but with less Compositea; high humidity (PB, LV, Mi).
2450 to 3700	2500 ± 70 2530 ± 70	Abundant vegetation, tree line probably above present elevation, warm humid climate (Miranda warm phase) (Mi, LC).
4150 to 5500	4240 ± 70 5250 ± 80 5290 ± 80	Vegetation similar to modern at the paramos but with less species at 4000 m elevation. Temperature and humidity start rising (LC, Mi).
6000 to 6250	6070 ± 80 6130 ± 80 6250 ± 140	Scarce paramo vegetation; climate cooler and drier than present (La Culata dry phase) (LC).
6300 to 8300	6240 ± 90 6350 ± 90 7530 ± 80	Vegetation and climate similar to present at paramos; vegetation abundant but poorer in species at 4000 m elevation (LC, Mi).
9360 to 11700	11470 ± 170	Poor superparamo vegetation; climate colder than today, average temperature ca. 2-3 °C below present (Mucubaji cold humid phase) (Mu, Mi).
11960 to 12250	12250 ± 150	Humid paramo vegetation at 3500-3700 m elevation. Climate similar to present (Mucubaji warm phase) (Mu).
12280 to 12650	12390 ± 250 12570 ± 130 12650 ± 130	Scarce superparamo vegetation at 3500 m elevation. Climate colder and drier than present; average temperature ca. 2.9 °C. Deglaciation (Mu).
Before 12650		Mérida glaciation

Mu = Mucubaji   LC = La Culata   LV = Laguna Victoria
Mi = Miranda   PB = Piedras Blancas

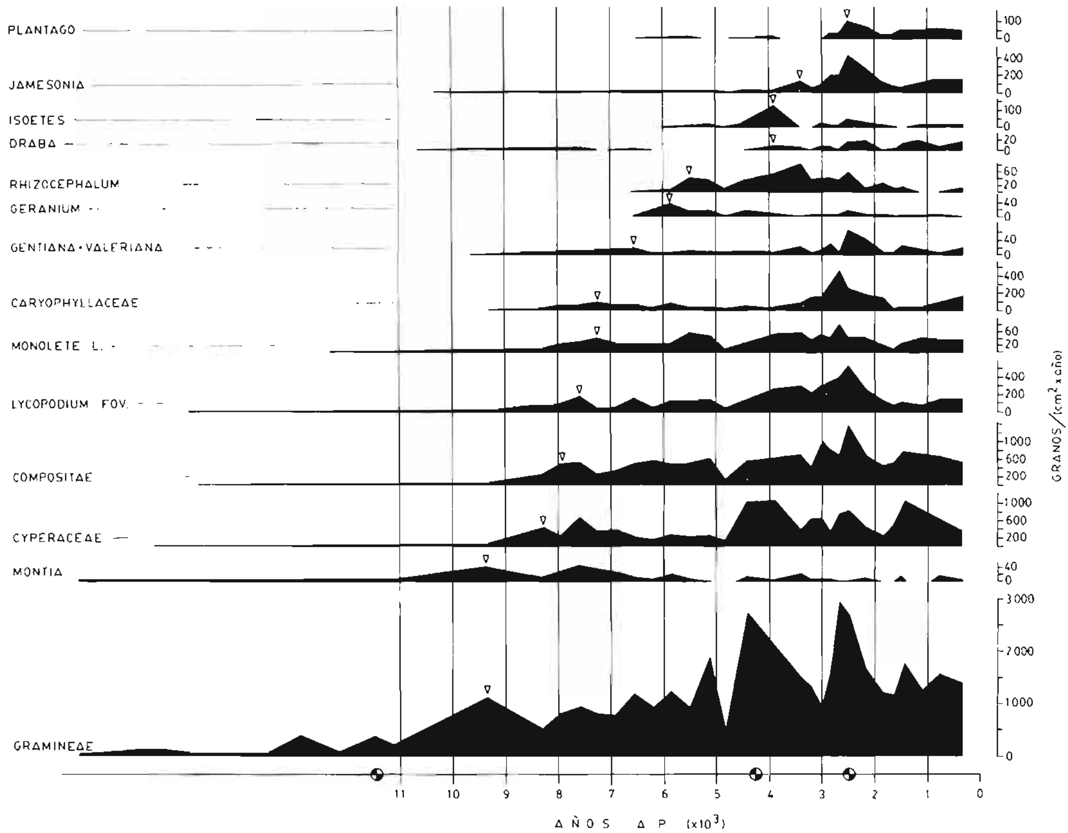

Fig. 1. Sequence of colonization of the newly deglaciated soil in the Paramo de Miranda, Venezuelan Andes (after Rull 1985).

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News Highlights from the 23rd IUBS General Assembly

The following are highlights of reports and decisions made at the 23rd General Assembly of the International Union of Biological Sciences, held in Canberra, Australia, 16-22 October, 1988.

Resolutions

RESOLUTION N° 1
IUBS Endorsement of the Scientific Program

The 23rd IUBS General Assembly
ENDORSES the report of the Scientific Program Committee,

REAFFIRMS its committment to a strong and effective scientific program, and in particular those related to : the Decade of the Tropics, Biological Nomenclature, and Biological Diversity.

Also considered was the statement on "IUBS Activities : An Overview", which had been worked out and amended at the 1986 IUBS Executive Committee Meeting. A small working group will be set up to investigate the way into which some of its content might usefully be converted into "guidelines".

RESOLUTION N° 2
IUBS Support to the IGBP

The 23rd General Assembly enthusiastically
SUPPORTS the International Geosphere/Biosphere Program (IGBP), and points out the several initiatives of the IUBS scientific program of possible interest to IGBP, especially the "Decade of the Tropics" Program.

IUBS STRESSES that there has been inadequate consideration of the influence of the biota on global processes, and urges IGBP to examine directly biological processes and determine more carefully the significance of the biota in the process of regulation.

Finally, it WISHES to draw the attention of IGBP to the studies that IUBS is organising on the impact of diversity of species, life forms, communities, and landscape elements on ecosystem function and global processes.

RESOLUTION N° 3
Support for Designation of Wet Tropical Forests of Australia

The 23rd General Assembly
RECOMMENDS in the highest terms, the action taken by the Australian government in nominating the Wet Tropical Forests of North Queensland for inscription on the World Heritage List.

It CONSIDERS that these Forests are of the greatest scientific and heritage importance and that their protection must be assured. Because the nominated area represents the remaining fragments of previously much more extensive forests, the General Assembly RECOMMENDS
That the whole of the nominated area should be listed.

It NOTES that the Bureau of the World Heritage Committee has already recommended that the full Committee inscribe the area on the World Heritage List at its December 1988 meeting. The Assembly fully ENDORSES this recommendation and CONSIDERS that inscription at this meeting is essential if the area is to be fully protected.

RESOLUTION N° 4
Support to Biological Taxonomy

The IUBS 23rd General Assembly :

RECOGNISING the importance of taxonomy as a fundamental framework for all biological research and education,

RECOGNISING that taxonomy also provides an essential framework for communication in agriculture, commerce, medicine, and other activity relating to biological products;

STRESSES the urgent need for increased resources to be made available for taxonomic education and taxonomic research in the light of rapidly increasing rates of extinction and the need for that research for the management and conservation of natural resources.

RESOLVES that its Commission on Biological Education in consultation with its Section of Plant Taxonomy and its Section of Zoological Nomenclature, be requested to DEVELOP an education program to :

a) explain the significance of taxonomy, especially in applied fields, and

b) clarify to users of biological names, the reasons behind taxonomic name changes and how they arise from progress in taxonomy itself.

RESOLUTION N° 5
On the Impact of Biological Nomenclature

The 23rd IUBS General Assembly :

RECALLING the conclusions and decisions of previous General Assemblies on the importance of a stable system of names of organisms based on a taxonomic understanding of their nature, both in fundamental research and applied fields;

RECOGNISING that a program on Improvement of Stability in Biological Nomenclature, has been adopted as part of the activities of the Union;

URGES international organisations and other appropriate institutions to provide adequate support to efforts to improve the stability of names in organisms;

INVITES the Commission on Nomenclature of Plants to appoint a Special Committee on Lists of Names in Current Use;

RESOLVES to request the International Commission of Zoological Nomenclature to study, in conjunction with appropriate agencies the feasibility of indexing, on an international basis, scientific names in zoology.

RESOLUTION N° 6
Nomenclature of Protists

The IUBS 23rd General Assembly :

APPRECIATING that today protozoa, algae, and the «lower» fungi are increasingly recognised as an assemblage of lower eukaryotic organisms called protists and that considerable numbers of these organisms have been subject to simultaneous nomenclatural treatment under both botanical and zoological codes,

RESOLVES that a multidisciplinary approach to problems resulting from such treatments be continued in order to harmonize further the two codes to improve infraordinal nomenclatural treatment of protists.

RESOLUTION N° 7
Motion of Thanks

The IUBS 23rd General Assembly has greatly

APPRECIATED the opportunity afforded to it to meet in Australia, and in particular in the beautiful city of Canberra, with its pleasing balance between the practical and the natural, the aesthetic and the functional. A parallel may be made between the deliberations on present and future directions of biological work and the environment in which they have been conducted in the present city which gives a glimpse of what an ideal city of the future may be like. The meetings of its constituent working groups have allowed their participants also to appreciate the other cities in which they have been held : Darwin, Perth, and Sydney.

The Assembly has APPRECIATED the quality and width of the scientific symposia that have been organised for its intellectual enjoyment and of the leisure activities for its relaxation.

It has APPRECIATED the friendliness and helpfulness of all those members of the community who have contributed to the smooth day-to-day running of the meeting.

For these and many other reasons it formally EXPRESSES its grateful thanks to His Excellency, the Governor General, the Australian Minister for Science, the Australian Academy of Science, and the Organizing Committee; and in particular to Professor David Curtis, President of the Academy, and to Dr. David Ride, Chairman of the Organizing Committee.

IUBS Executive Committee 1988-1991

President	: Professor J. Salanki (Hungary)
Past-President	: Professor O.T. Solbrig (U.S.A.)
Vice-Presidents	: Professor F. di Castri (France)
	Dr. W.D.L. Ride (Australia)
Secretary-General	: Professor G. Nicolis (Belgium)
Treasurer	: Professor D.F. Roberts (U.K.)

Voting Members :
Professor B. Dias(Brazil)
Professor W. Greuter (F.R.G.)
Professor A. Khalaf (Iraq)
Professor T.S. Okada (Japan)
Professor V. Sokolov (U.S.S.R.)
Professor I.E.P. Taylor (Canada)
Professor A. Urbanek (Poland)

Alternate Members :
Professor B. Baccetti (Italy)
Professor F.B. Golley (U.S.A.)
Professor P. Lasserre (France)
Professor Ma Shijun (China-Beijing)
Dr. M. Monasterio (Venezuela)
Professor L. Saxen (Finland)
Professor P.N. Srivastava (India)

The 24th General Assembly of IUBS

The Committee for the 24th General Assembly of IUBS noted that the General Assemblies prior to the 23rd in Canberra had been held in Budapest, Hungary (1985); Ottawa, Canada, (1982), Helsinki, Finland (1979); Bangalore, India (1976); Utaoset, Norway, (1973); and Washington, USA (1970).

The Committee was pleased to have before it an invitation from the Biological Council of the Royal Netherlands Academy of Arts and Sciences to hold the 24th General Assembly in 1991 in Amsterdam, Netherlands, a country in which the General Assembly has not met since 1961.

The Committee considered that the arrangements proposed by the Biological Council of the Netherlands Academy for hosting the Assembly were excellent and recommends that their invitation be accepted and that the 24th General Assembly of IUBS be held in Amsterdam, Netherlands in 1991.

Admission of New Members of the IUBS

The Admissions committee recommends that the application from the **Consejo Nacional de Investigaciones Cientificas y Tecnologicas (CONICIT)** for the admission of Venezuela as an Ordinary Member be accepted.

After reviewing the relevant documentation, the Admissions Committee recommends that the following applications for admission as Scientific Members of the Union be accepted :

1. **International Society for Animal Genetics** (formerly International Society for Animal Blood Group Research)
   President : E.M. Tucker (UK); Secretary : K. Bell (Australia).
2. **Organisation for the Phyto-Taxonomic Investigation of the Mediterranean Area (OPTIMA)**
   President : D. Phitos (Greece); Secretary : W. Greuter (F.R.G.).
3. **International Working Group on Taxonomic Data Bases in Plant Sciences** (TDWG)
   Chairman : V.H. Heywood (UK); Secretary : F. Bisby (UK).
4. **Interdisciplinary Commission on Bioindicators**
   Chairman : J. Salanki (Hungary); Secretary : D. W. Jeffery (Ireland).
5. **European Society of Nematologists (ESN)**
   President : K.B. Eriksson (Sweden);
   Secretary : D.I.F. Brown (UK).

International Commission on Zoological Nomenclature

Election of Members of the Commission

The Section of Zoological Nomenclature of the International Union of Biological Sciences held a ballot in Canberra on 17-18 October 1988, during the 23rd General Assembly of the Union, to fill five vacancies on the Commission.
The Council of the Commission had previously ruled four retiring members to be eligible for re-election, and seventeen additional nominations had been received.

The Section re-elected Prof C. DUPUIS (France; Heteroptera) and Prof L. B. HOLTHUIS (The Netherlands; Crustacea) as members of the Commission, and elected the following three new members :

Prof WALTER J. BOCK (*Department of Biological Sciences, Columbia University, New York, NY 10027, U.S.A.*). Prof. Bock is the Permanent Secretary of the International Ornithological Committee.

Prof UBIRAJARA R. MARTINS DE SOUZA (*Museu de Zoologia da Universidade de São Paulo, Caixa Postal 7172, 04263 São Paulo, Brazil*). Prof Martins de Souza specializes in Coleoptera, and is the Editor of *Revista Brasileira de Entomologia*.
Dr CLAUS NIELSEN (*Zoologisk Museum, Universitetsparken 15, DK-2100 Kobenhavn* o, *Denmark*). Dr Nielsen is chief editor of Acta Zoologica, Stockholm, and specializes in bryozoa and marine invertebrate larvae.

The commission intends to fill three new vacancies, and also that caused by the retirement of Mr. R. V. Melville on 14 February 1989. Any nominations additional to those already received must reach the Secretariat by 28 February 1989.

P.K. TUBBS
Executive Secretary, ICZN

10th International Soil Zoology Colloquium,

7-13 August, 1988, Bangalore, India

About 250 soil biologists, from more than 30 countries, met at the Ashok Hotel, Bangalore, to take part in the Colloquium, sponsored internationally by ISSS Subcommission D and IUBS, and in India by the Indian Society of Soil Biology & Ecology, the University of Agricultural Sciences, Bangalore, and the Indian Council of Agricultural Research (ICAR), New Delhi. Local arrangements were in the capable hands of Prof. G.K. Veeresh (Chairman) and Dr D. Rajagopal (Secretary), supported by 12 enthusiastic local committees, and a National Organising Committee, chaired by Dr M.V. Rao (Special Secretary - DARE, New Delhi).

At an impressive and well-attended inaugural session, the Colloquium was honoured by the presence of His Excellency P. Venkatasubbaiah, Governor of Karnataka State, who addressed the meeting, Sri R.V. Deshpande, Minister for Agriculture, Government of Karnataka, Dr N.S. Randhawa, Director-General, ICAR and Secretary, DARE, who presented a President's address, and a number of other distinguished guests. Following the inaugural session, introductory lectures were presented by Dr J.L. Sehgal ("Soil types of India") and Dr Janardan Singh ("Progress of soil zoology in India").

The remainder of the Colloquium programme was organised in eight sessions of oral presentations, each introduced by a thematic paper, and two poster sessions. Provision was made in the programme for a half day International Specialist Symposium on Apterygota, wich was chaired by Dr J.A. Wallwork.

Themes of the oral presentation sessions were :

- Termite ecology (7 papers),
- Harmful soil fauna and their management (13 papers),
- Impact of agronomie practices including pesticides and animal wastes on soil fauna (16 papers),
- Impact of forest denudation and silvicultural practices on soil fauna (5 papers),
- Role of soil fauna in nutrient cycling (12 papers) - functional relationships between soil microorganisms and soil fauna (8 papers),
- Morphology, ecophysiology and systematics of soil fauna (10 papers),
- Soil fauna as bioindicators (6 papers).

More than 100 posters were displayed. They covered many aspects of the subjects of the oral presentation sessions, as well as other subjects. They were particularly valuable in providing an overview of the wide range of research undertaken by soil zoologists in India.

In a country where most of the population is dependent for its basic needs on small-scale, intensive and sustainable agriculture, the understanding and intelligent manipulation of soil fauna, microorganisms and organic matter inputs to the soil to maximise production are vitally important. It was apparent that Indian soil zoologists have accepted the challenge to provide the necessary theoretical knowledge and practical guidance concerning beneficial and harmful soil animals.

Two additional discussion sessions, arising from the Colloquium sessions, were organised during the Colloquium :

- soil fauna and nutrient cycling,
- soil fauna and soil structure.

A summary of conclusions from the second of these sessions will be published in "Pedofauna".

A full-day excursion included a visit to the main campus of the University of Agricultural Sciences, Bangalore, recognised as one of the leading agricultural universities of India, visits to a village where the major industry is silkworm production, to a market where the farmers sell the silkworm cocoons, and to a small village silk-spinning factory.

The excursion then continued to a popular hill resort at Nandi Hills, originally a fortress, but now laid out in gardens and with two ancient temples.

Delegates to the Colloquium enjoyed two evenings of cultural shows, the first including music by a percussion band and a very lively display of folk-theatre typical of Karnataka State, and the second a programme of classical temple dances.

At a final Plenary Session of the Colloquium the following were elected as officers of ISSS Subcommission D :
Chairman : Dr M.B. Bouché (France);
Past Chairman : Dr K.E. Lee (Australia);
Vice-Chairman : Prof. G.K. Veeresh (India); Prof. V. Huhta (Finland); Prof. H. Watanabe (Japan);
Secretary : Dr J.C. Kuhle (West Germany).

An offer was received from Prof. V. Huhta to organise the 11th International Soil Zoology Colloquium, and in connection with it an International Symposium on Apterygota, at the University of Jyvaskyla, Finland, in August 1992.

The invitation is supported by the Academy of Finland and by the University of Jyvaskyla, and was unanimously accepted by the meeting.

It was agreed to establish an Advisory Panel, under the auspices of ISSS Subcommission D, on soil fauna and soil improvement. Dr L. Brussard (Netherlands) was appointed by the meeting as convenor of the Advisory Panel.

With the unanimous approval of those present at the Plenary Session, it was resolved that the Resolution below should be sent to the Director-General of the Indian Council of Agricultural Research, and to the Secretaries-General of ISSS and IUBS with a request that it be published in their Bulletins.

Resolution of a Plenary Session of the 10th International Soil Zoology Colloquium, meeting at Bangalore, India, 13 August, 1988.
Delegates to the 10th International Soil Zoology Colloquium, in Bangalore, recognise the high state of development of soil zoology in India and the determination of Indian soil zoologists to apply their efforts to the solution of practical problems of soil management and crop production.

Soil zoology concerns the wide variety of small animals that inhabit the soil. Some, such as white grubs, are serious plant pests, while others, such as earthworms, have beneficial effects on soil structure and fertility. Soil zoologists take a holistic, ecological view of the communities of soil animals, seeing them as part of the whole spectrum of bacteria, fungi and other organisms that influence soils and plants growth, while at the same time relating them to the chemical and physical properties of the soils in which they live. Their knowledge and work are particularly appropriate to the development of farming methods and pest control. For example, they can contribute their knowledge to the better understanding and further development of tillage practices, organic manuring, pest control and suitable systems of land management. They can provide important contributions to the development of low input sustainable agriculture, which is a major priority of international funding agencies, including the world Bank and USAID.

India is fortunate to have some of the leading soil zoologists of the world. Their research deserves good support and their advice should be widely sought for practical advice on soil management, when questions of agricultural planning and new developments are discussed, and also in environmental conservation issues. They should be given every encouragement to maintain their well established international contacts throught visits to soil zoology laboratories and conferences in other countries.

International Association of Botanic Gardens

The John Merck Fund of Boston, Massachusetts, has agreed to provide a three-year grant to the International Association of Botanic Gardens of US $ 78 425 to :

1) promote the defined objectives among botanical gardens worldwide.
2) gather information on capabilities and needs of botanic gardens worldwide.
3) seek means to increase funding for implementation of the defined objectives.
4) build, through subscription, secure funding for the Secretariat of I.A.B.G.

B.D. MORLEY
Secretary-General, IABG

PUBLICATIONS REVIEW

BIODIVERSITY

Edited by E.O. Wilson and published by National Academy Press, 2101 Constitution Ave, NW, Washington, DC 20418, USA. 1988 (521 pages).

This new book is based on the National Forum on BioDiversity sponsored by the U.S. National Academy of Sciences and the Smithsonian Institution, held in Washington, D.C., 1986. Targeted to scientists as well as to nonscientists, this book calls attention to a most urgent global problem : the rapidly accelerating loss of plant and animal species due to increasing human population pressure and the demands of economoic development.

MODELS IN INTEGRATED CROP PROTECTION

West Palaearctic Regional Section Bulletin of the International Organisation for Biological Control (IOBC/IUBS), 1988 (95 pages).

This second volume from the Working Group on the use of models in integrated crop protection marks ten years of meetings of the Group and includes papers devoted to the use of models in disease and pest forecasting, in crop loss appraisal and in development of decision-based schemes of control and decision management systems.

PESTICIDES AND BENEFICIAL ORGANISMS

West Palaearctic Regional Section Bulletin of the International Organisation for Biological Control (IOBC/IUBS), 1988 (143 pages).

Selective pesticides can be used to control pests without adversely affecting important natural enemies are needed for modern pest management. This is the first bulletin of a new series prepared by the IOBC Working Group on Pesticides and Beneficial Organisms and dealing with guidelines for tests of the effect of pesticides on beneficial organisms. It includes guidelines for testing side effects on 15 well known natural enemies.

BIOLOGICAL MONITORING OF ENVIRONMENTAL POLLUTION

Edited by M. Yasuno and B.A. Whitton and published by Tokai University Press, Japan, 1988 (291 pages).

This volume consists of the proceedings of the fourth IUBS international symposium on biomonitoring of the state of the environment, held on 6-8 November, 1987, in Tokyo, Japan. Thirty two scientific papers are included and deal with bioassay and monitoring of aquatic environments with fish, biomonitoring of aquatic and terrestrial environments with plants and invertebrates, and microbiological monitoring.

HISTORICAL BIOLOGY An International Journal of Paleobiology

Editor : E. Buffetaut, Co-Editors : K. Flessa and A. Hallam, Published by harwood academic publishers (First Issue published in 1988).

The aims and scope of Historical Biology is to provide a vehicle for developments in the sciences concerned with the history of life through geological time and the biology of past organisms and to promote the diversity of approaches in this rapidly expanding field.

OVERCOMING CONSTRAINTS ON THE TEACHING OF BIOLOGY : A Global Perspective

Edited by G. Rex Meyer, and published by the Unesco Regional Office for Science and Technology for South East Asia and the Pacific (ROSTSEA), 1988 (482 pages).

This volume was produced under the auspices of the IUBS Biological Education Commission in cooperation with Unesco. It includes finding of an IUBS CBE Working Group charged with investigating ways and means of overcoming constraints on effective teaching of biology at all levels of education. These findings are based on a survey of opinions of biology educators from various parts of the world about what the perceived to be the most criticial barriers to effectiviness.