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Editorial

First published in June of 1980, *Biology International* was the replacement for the “IUBS Newsletters” which had served mainly as an information disseminator among the Scientific and National Members of the Union. The idea of *Biology International*, originated at the XX Helsinki General Assembly, was to create not only a way of communication among the Union’s Members as well as with the specialized agencies of governmental and nongovernmental origin, but also to publish articles in which the great problems of modern biology were discussed and would be of relevant interest to biologists and the general public.

Because of the very positive reaction received from the first two issues of *Biology International*, in June 1981 an editorial board composed of active members of the Union representing the various disciplines of biological sciences was appointed. Consequently, at the last Executive Committee Meeting held August 27, 1982 in Ottawa (Canada), the first five issues were reviewed with the following conclusions made. It was recommended a Chairman of the Editorial Board be appointed and the inclusion of Professor M.S. Ghilarov on the Board, and “the development of a more consistent policy”, particularly in regard to feature articles dealing with general biological topics.

Due to the immense variety of living forms and the large number of disciplines that are involved in their study, it is evident that *Biology International* cannot replace the many specialized publications in the area of biological sciences. Its main task should be that of serving as an open forum for discussion of those problems that, because of their interdisciplinary nature, tend to the integration of contemporary biology. Topics concerning biotechnology, biological instrumentation, recombinant DNA, gene evolution, taxonomy and molecular biology, nitrogen fixation, bioindicators and others which express this unifying trend will receive preferential attention from the Editor.

*Biology International* is also interested in reflecting how biological sciences can help in improving human life by offering solutions to such problems as food shortage, demographic explosion, nutrition, land management, tropical forests, and human health in relation to environmental pollution. All feature articles will be submitted to reviewing before their acceptance and publication.

*Biology International* will continue to include “News Highlights”, based on the activities of the Scientific and National Members, Biological Education, Medicinal Plants, the Decade of the Tropics, and all other subjects in which IUBS has a special interest. Also continued will be “IUBS News”, reporting on the direct activities of the Union, and the “Calendar of Meetings and Courses” in biology.

In conclusion, *Biology International* is ready to expand and widen its scope in order to better serve the scientific community gathered under the auspices of IUBS.

E. De Robertis
Quantitative Measurements of Fast Processes in Living Cells

by Dr. I. Giannini, ASSORENI *, Dept. of Applied physics, Monterotondo, Roma, Italy

Starting from this issue, a special section of Biology International will be dedicated to biological instruments.

Free contributions from all Union Members will be accepted according to the general criteria of the news magazine.

Articles will contain short critical reviews concerning biological instrumentation and may be concerned in large part with work performed in the author's laboratory, but other relevant instrumental achievements from various researchers should be mentioned in order to have a general perspective of the field. Moreover, articles should be directed to the general audience of biologists and must be written with a concise and clear introductory section. Preferred articles are where a scientific problem is first exposed, then the most suitable instruments to solve it are illustrated.

Of course, the quite standard and opposite way (i.e., to start from a particular technique and to illustrate later the most important biological applications) would also be acceptable in some cases.

— The Editor.

SUMMARY

After the early works on cells containing natural photopigments, high sensitivity methods were developed for a more comprehensive study of transient events in biological tissues, which allow the quantitative measurements of fast chemical reactions occurring in the cell.

INTRODUCTION

Many new ideas for instrumentation and instrumental methods for cell biology were developed in the last few years. The automatic identification of different cells and the quantitative measurement of tissue characteristics are the main goals of these research efforts. Quantitative measurements of biochemical features of the cell will probably lead to the discovery of a new dimension of cytotology, since most of these aspects of cell chemistry could not be properly revealed by microscopic analysis. On the other side, the achievement of automatic recording and counting of different cells present in a tissue is a really demanding technology for clinical laboratories, where at the moment a large fraction of human resources are employed in tedious and repetitive jobs of leucocyte counting, etc. This second practical goal was probably very attractive for electronic industries, but is by far less impressive than the enormous amount of new fundamental scientific findings discovered in this context.

We cannot attempt a description of all this matter in a short paper, therefore our attention will be focused on those methods which were developed to measure the kinetic aspects of biochemical probes present in the cell, while other aspects of research such as cell sorting or cell electrophoresis, etc., could be the subjects for future articles in this magazine.

It is commonly understood that morphological and structural information is not sufficient for a complete description of most of the mechanisms of biological processes, and that dynamic experimentation would be essential in the determination of many important features of cell functioning. Such experimentation as the interaction of nucleic acids with other cell components during replication and expression, the movements of membrane embedded proteins induced by the binding of external molecules, the elementary interactions between different proteins present in the cytoplasm or in the organelles, and so on.

The aim of this exposition is to give a general feeling of the technical possibilities offered by the application of fast reaction techniques to cell biology, and for the growing research activity in this field. So, after a brief description of the early experimental achievements, we shall discuss successively the fast detection of chromatin substructures by fluorescent DNA-dye complexes, the potential-sensitive dyes allowing the experimentation on electrical impulse propagation in the nervous system, the various experimental approaches to the study of the protein mobility in cell membranes, and finally, the measurement of fast enzymic reactions in living cells.

* Association for the Scientific Research "ENI" Societies.
TIME RESOLVED TECHNIQUES

The first extensive attempt to give a kinetic description of elementary chemical events in living cells was performed on the photosynthetic membrane (Witt, 1971). Flash photolysis techniques had been introduced many years before and are well reviewed by G. Porter in classical papers (Porter and West, 1974). Repetitive excitation with averaging techniques was introduced and described by Ruppel and Witt (1969), and led to the realization of the apparatus schematically illustrated in fig. 1.

The light coming from a flashlamp or a pulsed laser hits a portion of the sample cell where also a second beam coming from a continuous source is focused. After the flash, the absorption of the sample is recorded at each wavelength, characteristic of the chromophore present in the cell suspension. The resulting waveform can be averaged on hundreds of pulses, if the perturbation is repetitive, thus obtaining a large noise reduction in the recorded trace. Many essential features of the apparatus illustrated in this scheme are also present in the more recent applications which are illustrated in this article. The sensitivity of this original apparatus, however, was not very high and quite large photoeffects were recorded. The following development deals with greatly increased sensitivity, due to better light sources, improved optical layout, the measurement of new physical quantities and special probes.

At the instrumental level, the main improvements were in time and space resolution, as well as in absolute sensitivity. Of course the high time resolution needed in some experiments involves a decrease of the signal to noise ratio because of the necessary increase of the detectors’ bandwidth. For this reason, no general purpose apparatus can be devised, and each instrumental solution must be tailored to the experimental needs.

In the following sections, some of the most representative instrumental realizations will be described, and their experimental performance discussed.

Microspectrophotometric Methods

One of the most attractive properties of laser techniques applied to spectroscopic observations is that light can be easily focused on a very small area of the sample. Such microscopic laser beams have been employed in a variety of studies, but until now only a limited amount of work has been done with the molecular aspects of cell biology. Prominent work illustrating these possibilities came from the groups at the universities of Milano and Pavia; pulsed dye laser was used focused by a microscope objective on the nuclear substance of a cell stained with Quinacrine dye, as shown in fig. 2 (Andreoni et al., 1979, Bottroli et al., 1980). Fluorescence is detected by a standard microscopy optical layout, and by large bandwidth electronics which allow nanosecond time resolved measurements. A very good space resolution (less than 1μm) without any
damage to the sample was also obtained. The excited state of intercalating dyes such as Quinacrine Mustard are differently influenced by the contact with different base pairs. The decay time of singlet states, and so, the decay of the light emission by fluorescence is very much longer if AT-AT sequences are present. This finding is clearly illustrated by the effect reported in several bacteria where the fluorescence of Quinacrine Mustard was measured in different bands of chromosomes with a well-defined content of base pair sequences (Andreoni et al, 1979). The same techniques were applied to the study of chromatin structure, differentiating the chromosome portions which are in the "active" state, with looser packing morphology, from the inactive forms (Bottiroli et al, 1980).

It is apparent from the results of these studies that a large amount of information could be collected on the nuclear matter of various cells. In this context a possible development of these researches toward selective chromosome modification by the use of selectively excited photochemical reactions has been suggested by the Authors (Andreoni et al, 1980). Other important applications of microscopic laser techniques come from a large class of instruments employed for measurements on cell membranes (see below).

**Voltage sensitive dyes**

In this section, another example of the application of the dynamic properties of some dyes will be mentioned. Fluorescent molecules which selectively bind to membrane structures in the cell can be used to detect voltage changes across the membranes. For more detailed information on the different dyes, extensive reviews are available (Waggoner 1979; Smith and Chance 1979, Cohen and Salzberg 1978).

Although today, this may appear as a still rather specialized subject, it is quite possible that in the near future it could become a very popular research area because of the important theoretical aspects on the functioning of nervous systems which are involved, since impulse transmission between many neurons can be visualized by these techniques (Cohen and Salzberg, 1978).

The dynamic response of different dyes varies depending upon the chemical nature of the reactions connected with the observed color change and the preferential binding site in the membranes. Fast and slow response dyes can be distinguished; the first class having reaction times of a few microseconds, while the slower ones respond in the millisecond range. Fast dyes are unfortunately less sensitive by almost one order of magnitude, and several of these dyes exhibit both responses (merocyanine 540, some oxinols) (Waggoner, 1979). The instrumental methods actually employed could be certainly implemented with microspectrophotometry, improved sensitivity, and the analysis of correlated events. Important developments of these studies can be expected in the near future, when certain unclear aspects of events connected with the nerve pulse transmission and their effects on the probes are clarified, and perhaps when more sensitive fast probes become available (Gupta et al, 1981).

Among these studies it is worth mentioning kinetic analysis of the ionic potential changes across the membrane induced by antibiotics like Valinomycin or Virginiamycin, etc.

Some effects had been recorded by the use of the above-mentioned dyes (Smith and Chance, 1979; Smith et al, 1980), and also direct measurement of electric conductivity as well as the measurements of color changes of the antibiotic molecule itself were employed (Grell and Oberbäumer, 1977). In the last case, a good description of the dynamic aspects of the interactions of the antibiotic molecule with the membrane and with ions is obtained, although measurements were made on model lipid vesicle systems because of the unfavorable overlap of antibiotic spectrum with other colored biological molecules present in the cells.

**Protein motility on cell surfaces**: correlation techniques, photobleaching recovery, depolarization of excited states, and allied techniques.

A large class of different techniques has been recently developed for the study and measurement of protein motility on the cell surface. A very good and detailed review was recently written by R.J. Cherry (1979) on this subject. Generally speaking, all these techniques employ a colored probe covalently attached to the protein that is the object of the measurements. Movements of the probe can be recorded with instruments based on different approaches, variously sensitive to movements of different kinds such as lateral motility, rotational movements of the protein, small local environmental changes due to lipid fluidity, etc.

Among the first methods developed in this connection were the so-called "correlation techniques" associated with fluorescent chromophores. If a very small portion of the cell membrane is illuminated by a laser beam, the fluorescence signal will fluctuate depending on the number of chromophores in and out of the illuminated membrane portion. Measuring the auto-correlation function of this changing signal gives a measurement of the velocity of chromophore displacement on the membrane surface and, consequently on the membrane lateral motility of the protein carrying the bound fluorophore (Webb, 1976). When polarized light is used, chromophores are excited with a preferential direction and rotational motility will cause a reorientation of the excited molecules. The measure of correlation function of the light emission under appropriate geometrical conditions makes it possible to measure such rotational movements of the protein embedded in the membrane (Ehrenberg and Rigler, 1976). These techniques are very attractive because they may provide a demonstration of the statistical nature of macromolecular movements. The sensitivity, however, is not as good as in the case of other instrumental methods described below, and the electronic equipment required is more complicated. However, very good correlators are now commercially available.

The fluorescence recovery after photobleaching is now the most widely employed technique for the measurement of lateral motility of proteins on membranes. Photobleaching of a fluorescent dye covalently bound to a protein can be easily achieved by an intense laser pulse focused in a portion of the membrane. Monitoring the fluorescence emission excited by a low power continuous beam on the same area is a direct way to measure the lateral
diffusion on the membrane of proteins carrying new unbleached chromophore molecules (Axelrod et al, 1976). This method is conceptually very simple, and the best optical set-up is obtained using a continuous laser focused at full intensity for a short time on an 10 μm2 spot of the membrane surface, attenuated then by a large factor (usually 10^3 - 10^6) for the time necessary to the measurement of fluorescence recovery.

A very large amount of such measurement on a variety of different cells has been obtained in the last few years by this technique, which is described in the survey by Cherry; lectin receptors were studied in myoblasts, in fibroblasts, in neurons and glia cells. The movements of surface antigens and receptors for hormones and neurotransmitters were also measured by these techniques.

In some cases, the photobleaching pulse may cause damage to the protein or membrane structures, but these are usually negligible; also the dynamic effect of polarized photon absorption could interfere with these measurements. A modification of the photobleaching method which uses the effect of the polarized light in a specific way was recently suggested (Smith and McConnel, 1981) and can be applied to measure lateral diffusion on very small lipid vesicles, since focusing on small areas is unnecessary by this set-up. A comparison of the diffusion coefficient obtained with photobleaching recovery can be obtained also with measurements of electrophoretic motility along the cell membrane (Cherry, 1979).

Rotational movements are quite well recorded with the use of two other techniques. The first, the so-called EPR saturation transfer methods (Thomas et al, 1976, Hyde, 1978) uses spin labels, while the second measures triplet depolarization of chromophores excited by a pulsed laser and was suggested and developed by R. J. Cherry’s group in Zürich (Razy Naqvi, 1973, Cherry, 1978).

Fluorescence depolarization measurements were classically introduced by Weber (1969, 1973) and applied to a large variety of biological macromolecules and recently to membrane “microviscosity” measurements (Chen et al, 1977). These methods are sensitive to very rapid relaxation effects in the nanosecond range, and in this time scale only the displacement of small molecules or small part of macromolecules could be revealed. With the introduction of triplet probes (Cherry, 1978), longer time scales were available and the measurement of rotational relaxation of large proteins embedded in cell membrane became possible. Times of the order of a fraction of a millisecond were easily measured. The triplet states are excited by a laser-polarized pulse, and triplet absorption dichroic states are monitored by the light coming from a lamp. The suspension must be deaerated in order to avoid triplet quenching from oxygen. Improved sensitivity can be obtained if phosphorescence emission is recorded (Austin et al, 1979). Similar results can also be obtained using a natural photoaction such as CO dissociation from cytochrome-oxidase, looking at dichroic absorption after CO selective dissociation with a polarized laser. (Junge and Devault, 1975) With these methods, a large variety of experimental results were published in the last few years, mainly concerning proteins in the erythrocyte membrane (the so-called band 3 proteins), lectin receptors, bacteriorhodopsin, etc.

Cell enzymology: measurements of fast transient events

Cytchemistry is a rapidly evolving branch of biochemistry, in which processes occurring in single cells or in biological tissues are followed by spectrophotometric techniques (Bilinsky and Chayen 1978). A strict connection with classical enzymology is apparent, this work being an obvious extension of the study of fast events occurring in enzymatic systems from artificial pure solutions to the “natural” cellular and tissue conditions.

This kind of experiment is particularly important in membrane bound enzymes, where solubilization processes can alter the tertiary structure of the proteins (Tanford and Reynolds, 1976). Fast processes in purified solution were studied by a large variety of methods ranging from stopped flow to fast relaxation techniques which are quite well described in some classical texts (e.g., Hamner, 1968). The application of such methods produced a very impressive amount of works on enzymatic reactions in the past years, leading to the conclusion that the very specific chemical events occurring in the enzymatic reaction are almost invariably connected with some conformational flexibility of the active site ligands (Jenks, 1975, Koahland, 1976) with the participation as a regulatory agent of the external ionic medium (Giannini et al, 1975, 1977, 1978; Giannini and Grasselli, 1976; Careri et al, 1975).

Our own work on the subject leads us to realize the importance of measuring these fast enzyme processes in living cells; because the kinetic performance of enzymes is strongly influenced by local conditions, a comparison between the data obtained under controlled model conditions “in vitro” and those recorded for the same system in the living cell could simultaneously inform us about the microenvironments in the subcellular compartment when the enzyme in question operates.

Enzymological work “in vivo” is obviously a very attractive idea, however, good measurements are not easily achieved. Two conditions are necessary in order to obtain some valid experimental result: first, very sensitive techniques are needed to measure events concerning quite dilute reagents in a cell suspension; and second, a very specific spectroscopic probe is required to examine a well defined chemical reaction within the complex intracellular environments. In the last few years we have developed very sensitive detection systems coupled with repetitive laser perturbation (Giannini et al, 1979). The main features of our apparatus are sketched in figs. 3 and 4. By an accurate optical set-up, we obtained the superposition of an observation beam and of the laser exciting beam in a small area of the sample (≈ 0.2 mm in diameter). The repetition at 70 Hz of the excitation pulse allowed averaging of thousands of pulses in a few minutes. Thousands of successive signal values are samples after each pulse by a transient recorder and are collected in a small computer. The employed optical sources are of course very well stabilized, but different monitoring detectors are employed in order to correct possible small instabilities. The final result of each measurement is an accurate record of optical density changes with a sensitivity of less than 3.10^-5 in O.D. units and 500 ns resolution time, even in a turbid solution suspension.
Fig. 3. Block diagram of the laser instrument for slow amplitude transient recording effects (Giannini et al. 1979).

Fig. 4. A detail of the sample compartment of the apparatus of fig. 3.
As an example of what the sensitivity of these methods can be, a trace obtained with a suspension of *Candida lipolytica* is illustrated in fig. 5. This yeast was particularly selected to grow in media containing n-paraffins as a carbon source, and we demonstrated that the terminal oxidase participating in the paraffin oxidation is a cytochrome "o", a heme protein with CO binding capacities (Baroncelli et al, 1979). By these laser flash methods, we also showed that the CO molecule bound to the heme group can be dissociated with a quantum yield larger than 0.5. The natural concentration of this enzyme in the cell suspension was $10^{-7}$M, but it was high enough to record a very good signal.

Fig. 5. An experiment on cells of *Candida lipolytica* showing a trace recording absorption changes at $\lambda = 436$ nm after the CO photodissociation from cytochrome o contained in living yeast cells, after the laser pulse. The laser wavelength was at 532 nm. Single and computer averaged records are shown for comparison. The chromophore concentrations in this experiment was less than $10^{-7}$ M (Baroncelli et al. 1979). The fast decaying reaction corresponds to a conformational effect.
The selectivity in this case was due to the particular photosensitivity of the natural probe and, of course, to the large changes in optical absorption coefficient of the Soret band of the heme group associated with the reaction. The CO recombination was followed under various conditions in living cells, as well as in the enzyme preparations after different purification steps. One of the most relevant characteristics of this reaction is that a conformational change, possibly connected with the quaternary structure of the enzyme (Savicki and Gibson, 1976), is recorded at a faster time scale and it was also clearly shown that this change is pH dependent as illustrated in fig. 6. These observations confirm the previously exposed general idea that enzyme activity regulated by ionic conditions "in vivo" is in agreement with evidence obtained on highly purified preparations "in vitro".

These fast recordings could certainly help in the "in vivo" study of complex systems containing analogous chromophores such as cytochrome P450 (see Gunsalus et al., 1978) and cytochrome c-oxidase (King, 1979). In other cases where natural probes are missing, dye molecules which have a distinct and known interaction with cell components may be used in order to obtain information on specific reactions with these kinetic methods. This approach has been successfully used in the measurement of enzymic activities in whole cells, such as the characterization of cytoplasmatic esterases using fluorescein-diacetate. The use of dyes in the detection of fast reactions in whole cells is shown in the two following examples taken from our current experimental work.

Let us first consider dyes containing a naphtol ring, such as Biebrich Scarlet (Giannini and Grasselli, 1976) or a naphtol ring with specific substitutions in the 6 or 5 position (Weber, personal communication) as illustrated by the general formula:

and the same with OH in 2 position for \( \beta \) naphtol. It is well known that the proton affinity of the dissociable group in naphtols decreases appreciably when the chromophore electron is in an excited state (Rosenberg and Brinn, 1972), and already we made use of these effects for the study of protein-dye complexes (Giannini and Grasselli, 1976). The absorption of one photon by the chromophore should cause proton dissociation, and it should be possible to follow the recombination reaction after a laser pulse. This recombination is very much dependent on ionic medium and on electrostatic forces, due to charged residues present near the dye so that it can be a very good probe of the microenvironment surrounding the dye. We have actually preliminary evidence for such reaction in Biebrich Scarlet associated to the positively charged cytoplasmatic proteins present in the granules of a suspension of human white blood cells (see fig. 7).
A very different approach, not concerning enzymes but nucleic acids uses dyes such as the well known intercalating Acidine Orange (AO). In this case, dynamic information on chromatin structure can be obtained not only at the nanosecond time scale by time resolved fluorescence (see para. 1), but also by recording triplet absorption and the effect on triplet decay due to the different dye environment (Giannini and Baroncelli, to be published). We have proven, for instance, that in lymphocytes stimulated with phorbol-12-myristate, the quenching effect on the triplet state of AO by Oxygen molecules is by far more efficient than in the quiescent cell population.

It is clear that shifting the explored time domain from nano- to microseconds (or to slightly longer times) with improved sensitivity, has the advantage of being able to afford many more kinetic studies such as the accessibility of DNA to external molecules, as well as the dynamic interaction with other cell structures. Moreover, in the future, these kinds of effects could be used for the development of simple diagnostic clinical test.

The few examples we have exposed in this paper illustrate, in a representative way, the possibilities of time resolved techniques in quantitative description of biologically relevant molecular events occurring in whole cells. A large amount of work on the molecular physiology of the cell will be carried out in the near future by these methods. Also, it should be recalled that many applications have been proposed to diagnostic cytology. We feel that this will be achieved in quite a short time, since the diffusion of these techniques will be facilitated by the availability of better pulsed light sources as well as by the ready-to-use inexpensive data processing facilities.


REFERENCES


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1. **Introduction**

The XXI General Assembly of the IUBS was held at Carlton University in Ottawa, Canada, August 22 to 26, 1982, upon the invitation of the Canadian National Committee to the IUBS.

Twenty-nine national adhering bodies were represented at the Assembly as well as delegates from the IUBS Scientific Divisions, Sections and Commissions. Officers representing UNESCO and UNEP were also present. A total of 108 participants were registered, plus observers from learned societies and biological organizations, and companions of delegates.

Two scientific symposia took place during the Assembly:
- **Symposium I** - “Biology of the Northern Oceans”
- **Symposium II** - “Environmental Education through Biology”,

in addition to three plenary lectures which were delivered on the subjects of “the Decade of the Tropics” by Professor O. Solbrig (Harvard University), “Forestry the Global View” by Professor B. Zobel (North Carolina State University), and finally “Molecular Organization of the Eucaryotic Genome” by Professor M.L. Pardue (Massachusetts Institute of Technology).

The XXI General Assembly constitutes an important event in the history of IUBS, for it associates the adoption of an important and ambitious scientific programme, as well as the establishment of new structures designed to aid the Union in implementing its objectives and better reflect the richness and diversity of biological sciences.

Other important accomplishments included the election of a new Executive Committee for the triennial period 1982-1985, the adoption of an updated version of the annual National Members' dues, and the admission of four new Scientific Member bodies. Nine resolutions were adopted, concerning issues such as responsibility to contribute to world peace, formation of IUBS groups, biological nomenclature, IUBS publications, transfer of technology to rehabilitate lost marginal lands in arid and semi-arid regions, and taxonomic and biological development in the Arab and African regions.

In conclusion, the decision was reached to hold the XXII IUBS General Assembly in Budapest, Hungary August 25-31, 1985, from the invitation made by the Hungarian National Committee to the IUBS.

2. **Amendment to the statutes**

The XXI General Assembly adopted the following amendments to the statutes:

**CONSIDERING** that the XXI General Assembly of IUBS has adopted the recommendation of the Ad Hoc Committee to restructure the Union, the General Assembly RESOLVES to adopt the following amendments to the Statutes as appropriate to support the structure already agreed upon.

Article 3 and Article 9 to be deleted, and the subsequent articles to be renumbered accordingly.

Article 10a) the last line to read:

“of seven consisting of the Past President and six named by the Officers from among the members present.”

Article 10b) to read as follows:

“the Executive consists of the President, two Vice Presidents, the immediate past President, the Secretary General, the Treasurer, and seven ordinary Members, who, together with the Officers, shall represent the main scientific interests of the Union. Seven Alternate Members shall also be elected. The task of the Executive Committee is to conduct the affairs of the Union in accordance with the decisions taken by the General Assembly.”

Article 10c) to stand up to line 5:

“...for re-election for several terms.”

Then delete five lines up to:

“...eligible for re-election.,”

and replace by:

“The ordinary Members are elected for one term and will not normally be re-elected, but the Alternates will be eligible for re-election.”

Same paragraph, lines 12 and 13, delete “Divisional Representatives” and replace by “Members”.
3. IUSS Executive Committee 1982-1985

A new Executive Committee was elected for the triennial period 1982-1985 as follows:

3.1. Officers

Prof. P. FASELLA
President, IUSS
Directeur Général pour la Science, la Recherche et le Développement
Commission pour les Communautés Européennes, Square 2, Mâjus, Bruxelles, Belgium

Prof. E.S. AYENSU
Secretary General, IUSS
Director, Office of Biological Conservation
Smithsonian Institution, Washington D.C. 20560, U.S.A.

Prof. C. LEVI
Treasurer, IUSS
Laboratoire d’Éthologie des Invertébrés Marins, 57, rue Cuvier, 75005 Paris, France

Prof. J. SALANKI
Vice-President, IUSS
Director, The Biological Research Institute of the Hungarian Academy of Sciences, 8237 Thany, Hungary

Dr. O. SOLBRIG
Vice-President, IUSS
Director, Gray Herbarium
Harvard University, 22 Divinity Avenue Cambridge, Massachusetts 02138, U.S.A.

Prof. E. DE ROBERTIS
Past President, IUSS
Instituto de Biologia Cellular
Facultad de Medicina, Paraguay
2155, 1121 Buenos Aires, Argentina

Dr. N. KHRUSHCHOV
N.K. Koltov Institute of Developmental Biology, 26 Vavilov St., 117334 Moscow, U.S.S.R.

Dr. M. NUMATA
Department of Biology, Chiba University
Yayoi-cho, Chiba, Japan

Dr. W.D.L. RIDE
Canberra College of Advanced Education
School of Applied Science, P.O.B. 1
Belconnen, A.C.T. Australia

Dr. A.K. SHARMA
Centre of Advanced Study
Department of Botany, University of Calcutta 35, Ballygunge Circular Road
Calcutta-700019, India

Dr. W. GREUTER
Botanischer Garten und Botanisches Museum
Berlin-Dahlem, 1000 Berlin 33, Königin-Luise-Str. 6., FRG

Dr. H.S.A. SALAMA
National Research Center, Tahrir St., Dokki, Cairo, Egypt

Prof. A. URBANEK
Department of Paleontology,
University of Warsaw, al. Zwiorki i Wigury 93, 02-089 Warszawa, Poland

3.2. Committee Members

Dr. W.A. FULLER
Department of Zoology, University of Alberta, Edmonton, Alberta R6G 2E9 Canada

Prof. N. GROBBELAAR
Department of Botany, University of Pretoria, Pretoria 0001, South Africa

Prof. P.J. KELLY
Department of Education, The University, Southampton S09 5NH, United Kingdom

Dr. N. KHRUSHCHOV
N.K. Koltov Institute of Developmental Biology, 26 Vavilov St., 117334 Moscow, U.S.S.R.

Dr. M. NUMATA
Department of Biology, Chiba University
Yayoi-cho, Chiba, Japan

Dr. W.D.L. RIDE
Canberra College of Advanced Education
School of Applied Science, P.O.B. 1
Belconnen, A.C.T. Australia

Dr. A.K. SHARMA
Centre of Advanced Study
Department of Botany, University of Calcutta 35, Ballygunge Circular Road
Calcutta-700019, India

Dr. W. GREUTER
Botanischer Garten und Botanisches Museum
Berlin-Dahlem, 1000 Berlin 33, Königin-Luise-Str. 6., FRG

Dr. H.S.A. SALAMA
National Research Center, Tahrir St., Dokki, Cairo, Egypt

Prof. A. URBANEK
Department of Paleontology,
University of Warsaw, al. Zwiorki i Wigury 93, 02-089 Warszawa, Poland

3.3. Alternates

Dr. A. BADRAN
President, Yarmouk University, Irbid, Jordan

Dr. J.C. CARVALHO
Museu Nacional, Quinta da Boa Vista, Rio de Janeiro, GB, Brazil

Prof. F. GOLLEY
Institute of Ecology, Athens, Georgia 30602, U.S.A.

Dr. E. GOMEZ
College of Fisheries, University of Philippines Dilliman, Quezon City, the Philippines
4. IUBS Scientific Programme
1982-1985

The Scientific Programme for 1982-1985 adopted by the XXI General Assembly includes six major projects related to the following areas:
tropical biology, medicinal plants, bioindicators, vegetation mapping, biological nomenclature and biological education.

4.1. The Decade of the Tropics. Chairman:
Professor Otto Solbrig
(Vice President, IUBS)
Director, Gray Herbarium of Harvard University
22 Divinity Avenue, Cambridge, MA 02138, U.S.A.

Considering the importance of the tropics to biological theory, and the importance of tropical biology to human welfare, it is proposed that IUBS establish a ten year program to be called “The Decade of the Tropics”.

The IUBS Decade of the Tropics has as its objectives, increasing our knowledge and understanding of the biology of the tropics from the various biological subdisciplines point of view and their application in production and conservation. The goal of the Decade of the Tropics is to facilitate research and communication among scientists as well as opportunities for travel in connection with research and international meetings, and to assist in the diffusion of the results of investigations.

The guiding principle must be collaboration. A first step will be to identify ongoing research projects in order to establish joint IUBS programmes.

While the Decade of the Tropics is directed at all aspects of tropical systems, the programme should concentrate initially on a few “themes”. The following five themes are suggested:
1) The means by which energy and minerals are transferred and stored within systems.
2) The means by which animal and plant species’ richness is maintained and the capacity for simplification of systems.
3) Biological factors of soil fertility.
4) The biology of agro-ecosystems (including aquaculture and forestry) in the tropics.
5) An understanding of human populations as traditional and changing components of tropical ecosystems.

The need is also recognized for a greatly increased effort into the inventory of tropical organisms. Attention should be concentrated on areas currently undergoing irreversible conversion as well as study sites.

It is proposed that the Executive Committee of IUBS consider the appointment of two committees to be responsible for the organization and operation of the Decade of the Tropics programme.

The first committee, to be called the “Steering Committee for the Decade of the Tropics” and made up of no less than five but not more than ten members, is to serve as liaison between researchers and the Executive Committee, and will organize and implement the scientific programme, and establish a communication network.

The second committee, to be called the “Advisory Board for the Decade of the Tropics Programme” and made up of approximately 25 members, will advise the “Steering Committee” in the direction of the programme. Its members should represent the interests of the appropriate sections and commissions of IUBS.

It is further proposed that the Executive Committee of IUBS charge the Steering Committee of the Decade of the Tropics programme with the preparation of a working document stating the aims, methods of operation, possible participants, proposed interactions with other institutions, and financial requirements for the programme. It is also suggested that a workshop of potential participating researchers be organized in order to assess the needs of researchers interested in forming part of the Decade of the Tropics programme and develop the programme description. Upon approval of the plan of action produced by this conference by the Executive Committee of IUBS, the programme would then enter its operational phase.

4.2. Medicinal Plants. Chairman:
Professor Edward S. Ayensu
(Secretary General, IUBS)
Director, Office of Biological Conservation.
Smithsonian Institution, Washington, D.C.
20560, U.S.A.

I. For the next three years, the recommendations of the “Ad Hoc Working Group on Medicinal Plants” (as mentioned in the Report of the Secretary General to the XXI Assembly) should be implemented as follows:

a) Collection and evaluation of existing information on medicinal plants? work should be carried on a regional basis by various scientists and existing institutions, in accordance with common guidelines. Particular attention should be given to taxonomy as well as to the source of the information.
Each survey may be independently financed and published under the author’s name with IUBS in the formally acknowledged role of coordinator.

With the below-listed regions having been or to be studied:

a.1. **West Africa and West Indies** - have already been published, with China and Arid Zones to be completed within 3 years by Ayensu and associates;

a.2. **East Africa** - has been published by Dr. Kokuaro of Kenya;

a.3. **Central and Southwest Africa** - Professor Sofowora of Nigeria should be approached. This work could be partially supported by the African Biosciences Network and the Organization of African Unity;

a.4. **North Africa** - has been studied by Dr. Loutfy Boulos of Egypt and the publication should appear within the next few months;

a.5. **Southern Africa** - Mr. Wells (Pretoria) shall be approached through the South African national adhering body;

a.6. **India, Pakistan and Southeast Asia** - Professors A.K. Sharma (Calcutta) and I.S. Ali (Karachi) are being approached for these studies. The president of the Asian Biosciences Network, Professor Krishnaswamy, and Dr. Khoshoo should also be approached;

a.7. **Central and South America** - Scientists and institutions have not as yet been identified. M. Roulet (Bern) has been approached for suggestions.

b) **The state of medicinal plants research in developing countries** has begun with the ABN medicinal plants group starting a survey of African universities and institutions. Seven have already been evaluated. IUBS is and shall continue to be associated in this survey with Professor Ayensu being the contact person.

b.1. Similar programmes could be instituted in Asia and Latin American countries.

b.2. Funds for this work could be obtained through the IBN and from the WHO Traditional Medicine Unit which is interested in the IUBS, particularly in taxonomy. For countries adhering to the Lome II Convention EEC-DF could be utilized.

b.3. IUBS National Committees of the U.S.S.R. and Australia will be approached for association in this project.

c) **The need to encourage developing countries to train plant taxonomists in medicinal plant identification.** A number of institutions capable of carrying out this most important programme have already been identified for the African region through the ABN.

d) **The establishment of training programmes in both developing and developed countries** shall begin with the organization of three-week workshops in the African countries. During these workshops suitable candidates could be identified for six-month training programmes abroad, either in well-established developing country institutions in Africa or in cooperative developed country institutions. Similar activities should be considered in South America (Dr. Cabrera of the Darwinian Institute in Buenos Aires).

II. Other suggestions:

The organization of an International Congress on Traditional Medicine in 1984 or 1985 has been suggested. The scientific programme should be carefully studied by the IUBS Medicinal Plants Committee before this suggestion is approved with reactions sought from other concerned scientific unions, such as CIOMS.

4.3. Biological Monitoring of the State of the Environment (Bioindicators).

Chairman:

Professor János Salánki
(Vice President, IUBS)
Director, The Biological Research Institute of the Hungarian Academy of Sciences, 8237 Tihany, Hungary

As a result of population growth and technological development, human activities induce various changes in the state of the environment. To avoid undesirable consequences, monitoring systems are required to recognize and predict hazardous effects in due time. Biological methods are of great importance in this respect.

Because living organisms and cell organelles vary in their sensitivity to environmental influences, they can be used as indicators at various levels of integration to assess and predict environmental changes in a timely manner.

Recognizing the importance of biological indicators in monitoring environmental conditions, and based on existing research in different branches of biology, it is recommended that IUBS promote research and international cooperation in the field of bio-indicators, by:

1) encouraging all sections, scientific and national bodies to develop and improve integrative methods indicative of environmental changes;

2) promoting interdisciplinary and international cooperation in standardizing and extending the use of agreed methods (publication of guidelines, etc.) and supporting appropriate projects designated to achieve these objectives;
3) encouraging exchange of current research and results among laboratories of different countries;
4) supporting conferences dealing with bioindicators of cellular, individual, population and ecosystem levels.

Furthermore, it is recommended that the Executive Committee of IUBS appoint a committee to organize a workshop to review past, ongoing and proposed monitoring programmes in order to identify the important aspects of biological monitoring requiring attention.

4.4. Vegetation Map of Europe. Chairman: Professor Adam Urbanek
Department of Paleontology, University of Warsaw at Zwirki i Wigury 93, 02-089 Warszawa, Poland

Present vegetation maps of Europe show only the basic types of vegetation. On the other hand, national maps contain valuable ecological information which is not utilized for the common used mapping system. For the purposes of nature protection, landscape planning and teaching in schools, it appears reasonable to elaborate within international collaboration, the map of natural vegetation of Europe within the scale of 1:3,000,000 (or if need be, 1:2,500,000), including the textual part.

The idea to elaborate this map was brought up at the Botanical Congress in Leningrad. Upon the recommendations of Prof. Dr. W. Trauttman (FRG) and Professor Dr. P. Ozend (France), two colloquia were organized on this question, with participation on an international level. The Botanical Institute of the Czechoslovak Academy of Sciences in collaboration with the Czechoslovak National Committee to the IUBS, and botanical institutes representing the countries of Bulgaria, Yugoslavia, France, Hungary, GDR, FRG, Poland, Austria, Romania, Norway, Finland and USSR also took part in these works.

It is proposed that the concept of a detailed vegetation map of Europe be approved, and that IUBS encourage international collaboration among different interested groups (Flora Europea, Czechoslovak Academy of Sciences, the EEC, etc.) to produce a unified map, and to offer the pages of *Biology International* for a presentation of the programmes and issues.

4.5. Nomenclature of Organisms Treated both as Plants and Animals. Chairman: Professor W.D.L. Ride
Canberra College of Advanced Education
School of Applied Science, P.O.B. 1
Belconnen, A.C.T. Australia

A number of species of acellular organisms are treated in both botanical and zoological nomenclature. Because the rules governing nomenclature in botany and zoology are different, such organisms may be known by different names in the literature, concurrently.

In recent years, particularly in botany, a solution has been attempted to deal with the problem, for names at any rate, by conserving individual names acceptable in zoology under the botanical Code (see Silva, 1980, *Taxon* vol. 29, pp. 121-143).

The International Code of Botanical Nomenclature also progresses toward meeting the problem by giving names of algae, first established as those of animals, priority from the date that they are established under the International Code of Zoological Nomenclature (Bot, Code Art. 45.4). This concession does not apply to myxomycetes, also sometimes treated as animals. The Third Edition of the International Code of Zoological Nomenclature will require that for a name of an organism, first classified as a plant, to be acceptable under the zoological Code it must be legitimate under the botanical Code as well.

Despite these concessions, there are fundamental differences in the operation of the Codes that make the treatment of names different under the two Codes depending on which Code is used by the worker to determine the "right name" for a taxon. For instance, the concept in zoology that names are coordinated within each of the family group, genus group, and species groups (i.e., that a name established at any rank in one of the groups is simultaneously established at all other ranks in that group), as compared with the rule in botany that names at any rank compete for priority only with names established at that rank (including names established as autonyms), results in a fundamentally different approach to the Principle of Priority in the two Codes. Similarly, the concept in botany that different combinations formed by several generic names and the same specific name are different names, while in zoology when such combinations involve the allocation of the same specific epithet to different genera they are regarded only as different combinations, not different names, produces a different approach to the Principle of Homonymy.

Different approaches to the substitution of preoccupied names, and to the correction of incorrect spellings, also results in names being correct under one Code and not the other (see examples in Silva, op. cit.).

Different starting points in the two Codes (1 May 1753 in botany, for relevant organisms; 1 January 1758 in zoology) and the fact that a name may be invalid (= incorrect, botany) because preoccupied under one Code and not under the other, results in different usages (also see examples in Silva, op. cit.).
Possible solutions

1. Ecumenical approach: A possible (but probably utopian) solution would be to unify the Codes. However, the differences are so fundamental and have been established for so long that the change would result in a considerable number of name changes in both kingdoms. For instance, Brummitt and Greuter have independently estimated that some 15-20% of the names given to infraspecific taxa of Spermatophyta would have to be changed if the botanical Code adopted the coordinate concept of the zoological Code (Greuter and Voss, 1982, *Englera*, vol. 2, pp. 23,4). However, it is likely that some changes could be made to the Codes that, while producing little effect on the question of the correctness of names under the two Codes, might make things a little easier for those who have to use the products of the two Codes such as biologists working in fields such as ecology and biological survey, and for the editors of their writings, who are faced by different conventions in the citation of authorship and the use of parentheses.

2. Case-by-case approach: Silva (op.cit.) has demonstrated the use of this approach at the generic level. Until a detailed study of the problem reveals the number of names requiring treatment to achieve uniformity, it is not possible to decide whether the approach is feasible. It is clear that the decision by the International Botanical Congress (Sydney, 1982) to admit the conservation of specific names in botany (although limited to species of major economic importance) will enable a greater uniformity to be achieved piecemeal than has been possible hitherto. However, for anything effective to be achieved by such a procedure, coordinated action would be required under both Codes.

3. Separate Code: A solution might be to follow the lead of the bacteriologists and to establish a new and separate Code for all protists that would be more suited to the solution of nomenclatural problems in microscopic organisms and to achieve stability and uniformity in their names. Both Codes are currently more suited to the treatment (especially in requirements for typification) of macroscopic organisms and those that can be identified by gross morphological criteria; but in recent years the responsible organizations have discussed amendments to make both more suited to the needs of microbiologists (see *Taxon* vol. 28, p. 428; vol. 30, pp. 102,3; *Englera* vol. 2, pp. 34-40; *Bull. Zool. Nomencl.* vol. 34, pp. 173, vol. 35, pp. 200-208, vol. 36, pp. 17-21, vol. 37, pp. 199, 212). Even if a separate Code is considered undesirable, it is clear from these discussions that a joint approach to the problems of description and typification of protists would be desirable.

4. Arbitrary allocation: Jeffrey (1982, *Kew Bull.* vol. 37, pp. 403-416 — in press) has proposed that the problem might be met by the arbitrary allocation to the different Codes of those taxa of Protista that are customarily the primary concern of botanists (as “Divisions”) or of zoologists (as “Phyla”). In this proposition, the following Phyla would be the responsibility of the zoological Code, the remainder would come under the botanical Code:

**Phylum Ciliophora**
- Opalinida
- Cnidosporida
- Apicomplexa (Sporozoa)
- Caryoblastea
- Rhizopodata
- Foraminifera
- Radiolaria (Acantharia, Polycystia, Phaeodaria)
- Heliozoa
- Porifera

The feasibility and attractiveness of this proposition would depend, to a great extent, upon the way in which workers are distributed among the taxa. If most workers on Protista confine themselves to one or other of these arbitrary groupings, the proposition would solve the problem; but if many would have to use two Codes, it is unlikely that the benefit would be sufficient to make the proposition worthwhile.

**Recommendation**

It is recommended that the Executive Committee of IUBS should refer the alternatives considered in this paper to the IUBS Sections on Zoological Nomenclature and Plant Taxonomy with a request that the Sections establish a joint committee to study them with a view to making recommendations to the International Commission on Zoological Nomenclature and the Section on Nomenclature of the International Botanical Congress.

**Acknowledgement**

This minute was prepared following discussions with R.K. Brummitt, C. Jeffrey, Hj. Eichler, R.V. Melville, D.H. Nicolson, and C.W. Sabrosky.

It is presented with the concurrence of N. Grobbelaar.

Ref. IUBS General Assembly Resolution 8 (Helsinki): Names of organisms common to botanical and zoological nomenclature.
4.6. Biological Education. Chairman:
Professor Peter Kelly
Department of Education
The University, Southampton SO9 5NH, U.K.

This project, considered as an interdisciplinary and intersectional activity within IUBS, is centered on the IUBS Commission for Biological Education.

Undertaken in close cooperation with UNESCO (Division for Science and Technology Education) and ICSU-CTS, these activities focus on biological education and its contribution to the quality of life, as well as on health education, nutrition education, and environmental education through biological education.

The future programmes will be the following:

Biological Technology Education
(i) Professor Gutierrez-Vasquez would involve the ICSU-CTS group on Primary Science, of which he was Chairman, in developing activities for young pupils which could help their appreciation and understanding of the biological technologies which they would encounter in later studies.

(ii) Dr. Mayer would produce the book on “Genetic-based Biological Technologies” for the “Biology and Human Welfare” series for secondary school teachers and teacher-educators.

(iii) Dr. Kille would develop a project on teaching related to biotechnology at the tertiary level. This would include a seminar on the “Perspectives of Biotechnology” involving businessmen and other community decision-makers besides academics.

Health Education through Biology
(i) The surveys of health education in different regions would continue to be co-ordinated by Dr. Hernandez.

(ii) Professor Schaefer would produce the book on “Health” in the “Biology and Human Welfare” series supported by information provided by members of this project.

(iii) Professor Schaefer would arrange a seminar on health education at the 1983 meeting of the Commission. Support will be sought from the Division of Science, Technical and Vocational Education, UNESCO.

(iv) Professor Schaefer would co-ordinate contributions on Health Education to the proposed ICSU-CTS Conference in 1985.

Biology and the Quality of Life
(i) The group produced a questionnaire to be distributed by members of the Commission. This would extend the survey of opinions on the definition of the quality of life.

(ii) Dr. Atchia would produce a draft statement on “Biology and the Quality of Life” to be discussed by the Commission in 1983 and developed into a booklet for the ICSU-CTS Conference in 1985.

Constraints on Effective Biology Teaching
The survey would be continued. A draft report would be prepared for consideration at the meeting of the Commission in 1983.

Biology and Human Welfare Series
Professor Kelly would co-ordinate the production of these books involving people outside the Commission as well as members. Drafts would be produced for final consideration at the Commission’s 1983 meeting.

Future Meetings
The following programme was agreed.

1983
A meeting organised by Professor Badran in Jordan from 3-8 September. This would include a business meeting of the Commission, workshops on the Commission’s four projects, an editorial review of the “Biology & Human Welfare” publications, and seminars on “Health Education” (directed by Professor Schaefer) and “Perspectives of Biotechnology” (directed by Dr. Kille) Participants from Jordan and neighbouring countries would be invited to the seminars.

1984
A meeting organised by Dr. Mayer in Colorado, U.S.A. at the end of August or early September. Possible topics would be extension of the current projects, especially that on constraints, the international impact of BSCEs, examinations and assessment, and practical laboratory and fieldwork for new topics in biology courses.

1985
A meeting organised within the proposed major ICSU-CTS Conference on “Science and Technology Education and the Quality of Life”. The Commission would participate in the conference and at the same time conduct its own business meeting. It was noted that Professors Schaefer and Rao had agreed to co-ordinate the work at the conference in the fields of “Health” and “Food and Agriculture” respectively. It was anticipated that other members of the Commission would contribute to these and other topics.
5. Resolutions

The XXI General Assembly of IUBS adopted nine resolutions which are as follows:

**RESOLUTION 1 : RESPONSIBILITY TO CONTRIBUTE TO WORLD PEACE**

RECOGNIZING that the objectives of IUBS can be realized only in a peaceful and stable world,

CONSIDERING that biologists have a particular part to play in promoting the peaceful uses of scientific knowledge in all countries,

EXPRESSING concern at recent deterioration of the international situation with increasing conflict and the arms race,

URGES biological scientists everywhere, and adhering organizations of IUBS in particular, to work towards world peace and to demonstrate to governments the vital necessity of avoiding war and war-caused suffering.

**RESOLUTION 2 : FREE CIRCULATION OF SCIENTISTS**

EMPHASIZING the fact that the circulation of persons as well as ideas has become easy and frequent throughout much of the world, and

EMPHASIZING further the fact that this rapid communication has been of the utmost benefit to scientific discoveries and their application for a better way of living of mankind,

OBSERVES however, with regret, that even today after several decades of efforts by a number of international organizations, scientists are sometimes prevented from travelling freely, attending scientific meetings and visiting scientific institutions in other countries,

STRESSES the fact that such an attitude is damaging to the scientific community and therefore, to mankind,

RECALLS the basic policy of ICSU of non-discrimination which affirms “the rights of scientists throughout the world to adhere to or to associate with international scientific activity without regard to race, religion, political philosophy, ethnic origin, citizenship, language or sex”, as provided by the ICSU booklet “Advice to Organizers of International Scientific Meetings”, published by the ICSU Standing Committee on the Free Circulation of Scientists,

RECOMMENDS with the utmost insistence that the adhering bodies of IUBS and the responsible authorities in all countries respect the rights of scientists to adhere to, and associate with, international scientific activities, to assist international scientific meetings, and adopt policies towards scientists with comprehension, tolerance and generosity for the benefit of our rapidly changing world.

**RESOLUTION 3 : FORMATION OF GROUPS**

NOTING that the XIII International Botanical Congress meeting in Sydney, Australia in August 1981 resolved unanimously to urge the IUBS to maintain the present Division of Botany and Mycology in any restructuring of IUBS,

CONSIDERING that IUBS has recommended the formation of groups based on scientific interactions and that the matter of their recognition be a responsibility of the Executive Committee,

HOLDING that the sections and commissions of the former Division of Botany and Mycology could appropriately constitute such a group,

NOTING that the Section of General Botany intends to approach the following Sections and Commissions to participate:

**Sections of**

General Botany
General Mycology (IMA)
Horticultural Science (ISHS)
Palaeobotany (IOP)
Plant Growth Substances (IPGSA)
Plant Pathology (ISPP)
Plant Physiology (ISPP)
Plant Taxonomy (IAPT)

**Commissions on**

Algology
Bee Botany (ICBB)
Botanical Gardens (ABG)
Eriksson Prize Fund
Mushroom Science
Nomenclature of Plants
Nomenclature of Cultivated Plants
Palynology (ICP)
Plant Protection Congresses
Seed Technology (ISTA)
Succulent Plants (IOS)

RESOLVES to urge the Executive Committee of the IUBS to recognize a group.
RESOLUTION 4 : FORMATION OF GROUPS

RECEIVING a request from the Polish National Committee to establish a group of Sections and Commissions with special interests in Systematic and Evolutionary Biology,

CONSIDERING the significance of Systematic and Evolutionary biology in other cognate fields such as contemporary life sciences as well as in the education and culture of society,

RESOLVES to urge the Executive Committee of IUBS to assist the Section of Evolutionary and Systematic Biology to approach relevant Sections and Commissions to establish a group.

RESOLUTION 5 : COMMON APPROACHES TO BIOLOGICAL NOMENCLATURE

CONVINCED of the need to achieve greater harmony in the codes governing different systems of biological nomenclature,

CONSIDERING the recommendations following from the Resolution of the XX General Assembly on the Names of Organisms common to Botanical and Zoological Nomenclature,

RECEIVING a Resolution of the International Congress of Systematic Bacteriology seeking an integrated approach to common problems of nomenclature among Botanists, Bacteriologists, Virologists and Zoologists,

RESOLVES to request the International Commission on Zoological Nomenclature and the Commission on the Nomenclature of Plants to establish a joint committee to examine alternative solutions to achieving a universal system of names for protists, and to invite organizations responsible for nomenclature of bacteria and viruses to participate.

RESOLUTION 6 : BIOLOGICAL NOMENCLATURE

NOTING the decisions and conclusions of previous General Assemblies on the fundamental and applied importance of taxonomy, including nomenclature.

ACCEPTING that it is an inescapable role of IUBS to provide a secure international basis of support for all systems and of biological nomenclature,

NOTING with pleasure that the assistance provided by IUBS and the British Research Councils through the Royal Society, during the triennium 1980-82, has enabled the International Commission of Zoological Nomenclature to continue its work and to raise sufficient funds to provide for the immediate future,

RECOGNIZING that, although nomenclature provides a fundamental base for communication in biological science, the cost of its systems is seldom included in the financial structure of the projects it serves,

RECOGNIZING that the provision and operation of systems of biological nomenclature must be international responsibilities and that IUBS has demonstrated and must continue to demonstrate its concern and support,

ASKS the Executive Committee to be ready to assist the organizations responsible for biological nomenclature when the need arises and, in particular, to support the International Trust for Zoological Nomenclature in its current financial difficulties.

RESOLUTION 7 : SUPPORT FOR IUBS PUBLICATIONS

NOTING the successful establishment of Biology International by IUBS since the XX General Assembly and COMMENDING the achievements of the Executive Secretary in this regard,

NOTING, the publication of Crop Genetic Resources - The Conservation of Difficult Material, being the proceedings of an international workshop held at the University of Reading, United Kingdom, September 8-11, 1980, and the first book published by IUBS since 1961,

RECOMMENDS that IUBS establish a regular publishing channel with a firm or agency having an established sales organization, and

COMMENDS to Sections and Commissions of the Union the IUBS publications as a convenient means of publication.

RESOLUTION 8 : TRANSFER OF TECHNOLOGY TO REHABILITATE LOST MARGINAL LANDS IN ARID AND SEMI-ARID REGIONS

RECOGNIZING that the need to rehabilitate marginal lands and to introduce non-traditional crops as a means of reducing world hunger is particularly acute in arid and semi-arid regions,

KNOWING that scientific information and technology required are already available in many parts of the world,

RESOLVES to request national and international organizations to support the work of
transferring technology to developing countries to extend areas of cultivated land through the introduction of non-traditional crops.

**RESOLUTION 9 : TAXONOMIC AND BIOLOGICAL DEVELOPMENT IN THE ARAB AND AFRICAN REGIONS**

RECALLING the Resolution of the XX General Assembly recommending funding bodies to actively help the establishment and maintenance of taxonomic collections in developing countries,

RECEIVING with pleasure, news that the Egyptian Academy of Scientific Research and Technology has approved the establishment of a Natural History Museum in Egypt to enhance and provide taxonomic collections, and research, training and education in the biological sciences,

ENDORSES the museum as a project serving the aims of IUBS,

RESOLVES to support approaches to UNESCO, the ICSU Biosciences Networks, and other relevant organizations, to establish and develop the project.

6. IUBS new scientific members

The XXI IUBS General Assembly admitted the following new Scientific Members:

6.1. The International Society of Biometeorology (ISB)
President, Dr. H. Lieth, Chair of Ecology, Postfach 4489, Seminarstrasse 20, D-4900 Osnabrück, FRG

6.2. The International Society of Invertebrate Reproduction (ISIR)
President, Prof. Wallis H. Clark, Jr., Dept. of Animal Science, Univ. of California, Davis, CA 95616, USA.
Secretary, Prof. K.G. Adiyodi, Dept. of Zoology, Calicut University, Kerala 673 635 India.
Treasurer, Dr. D.F. Went (Switzerland).

6.3. The International Association of Environmental Mutagen Societies (IAEMS)
President, Prof. Per Ofstead, Box 1031, Blindern, Oslo, Norway
Secretary, Prof. B. Kilibey, Institute of Animal Genetics, West Mains Road, Edinburgh EH9 3JN, U.K.
Treasurer, Dr. S. Wolff, Laboratory of Radiobiology, Univ. of California, San Francisco, CA, USA

6.4. The International Union of Reticuloendothelial Societies (IURES)
President Pro Tem, Dr. Sherwood M. Reichard, Division of Radiobiology, Medical College of Georgia, Augusta, GA 30912, USA

Secretary Pro Tem, Dr. Peter Abramoff, Biology Dept., Marquette Univ., Milwaukee, WI 53233, USA

6.5. European Association of Science Editors (EASE)
(Already member of IUBS under the name of European Life Science Editors' Association, ELSE)
President, Dr. Stephen Lock, British Medical Journal, BMA House, Tavistock Square, WC1H 9JR, U.K.
Secretary/Treasurer, Miss Nancy Morris, P.O.B. 33, Farnham, Surrey, GU10 3JX, U.K.

7. IUBS representation at the meetings of other organizations

The XXI General Assembly discussed the representation of IUBS at the meetings of other international organizations and its important and increasing financial implications.

It was decided that IUBS official delegates should be appointed from those scientists residing in the country hosting the meeting and that whenever possible, they should be members of the National Committee. This, in addition to economizing, will improve contacts between IUBS and the National Committees.

8. IUBS Finance

8.1. The IUBS XXI General Assembly discussed the Treasurer's Report for 1979-1982 which was in turn, unanimously approved.

8.2. National Dues

In view of the fact that

- inflation has considerably eroded the value of money during the past six years, being time lapse since the last dues’ adjustment,
- considering that IUBS has initiated some new and important scientific programmes, and
- all adhering bodies are at present operating under severe financial constraints,

It was moved that

a) the Union's total annual income from membership dues be increased from the present approximate US$ 160,000 to at least US$ 200,000 for the period 1983-1985. Therefore, the value of the unit contribution be increased from US$ 200 to US$ 1,000 to meet the minimal cost of the present day membership and that the contributions from Member Countries be adjusted accordingly, as shown in table I.
Eventually, it is highly desirable to adopt a rational approach such as the formula suggested by Professor J. Vallentyne (see issue no. 5 of Biology International), and with this in mind, asked the Executive Committee to study the matter in further detail and to submit specific proposals which will presumably involve amendments to the Statutes.

b) Energetic efforts to recruit additional Member Countries be expanded, and

c) the IUBS should continue to invite additional funds by formulating sound and attractive projects which other organizations would be willing to finance or co-finance, and during whose execution the IUBS could be of assistance.

Attention was drawn to Article 11 of the Statutes which reads: “A country which has not paid its contributions for three successive years shall be regarded, on notice having been given by the Treasurer, as having resigned, the three annual payments being debts outstanding.”

In this regard it was noted that the following Member Countries have not paid dues for at least three years: Korea, Libya, Nigeria and Zaire.

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**NATIONAL ANNUAL DUES TO THE IUBS (1983-1985)**

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<tr>
<td>FRANCE</td>
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<td>SUDAN</td>
<td>1,000</td>
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<tr>
<td>GERMANY (GDR)</td>
<td>2,000</td>
<td>SWEDEN</td>
<td>4,000</td>
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<td>SWITZERLAND</td>
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<td>TAIWAN</td>
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<td>THAILAND</td>
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<tr>
<td>HUNGARY</td>
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<td>UNITED KINGDOM</td>
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<td>YUGOSLAVIA</td>
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</table>

**GRAND TOTAL**

US $ 193,000

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9. The XXII General Assembly of IUBS

The XXI General Assembly decided:

— the XXII General Assembly of IUBS shall be held in Budapest, Hungary, August 25 to 31, 1985, upon the invitation of the Hungarian National Committee to IUBS, and

— the themes of scientific symposia be developed by the Executive Committee in cooperation with the Hungarian National Committee. Consideration may be given to problems mainly related to the scientific topics initiated by IUBS.
XX Anniversary of ICRO

The starting of the International Cell Research Organization by UNESCO, was celebrated on the 22nd of June, 1982, with a council meeting and a very interesting programme of lectures held at the Institut Pasteur in Paris. The time was ripe to make an overview of the work of this organization, mainly devoted to training courses in the many different fields of cell and molecular biology.

Since its beginning, some 150 such courses were held, mainly in developing countries, and about 3000 young scientists throughout the world received the benefit of intense training which was of great help in their research career. As can be gathered by the follow-up, in many cases there was a decisive influence in the life of these young investigators. A small follow-up programme sometimes complemented the action of these courses.

In recent years, ICRO has carried its activity through four panels, each one led by a convenor. The panel of Applied Microbiology has been very active since 1965 and has its own independent budget provided by UNESCO. The others are on Plant Cell Biology; on Structure, Function and Reproduction, and on Genetics, Reproduction and Development.

The Council has taken the bold action of reducing the number of the officers of the Executive Committee from 10 to 8, and of the Council from 27 to 25. In addition, the four convenors have been incorporated in the Council. From 1983 on, Dr. Robert D. Perry, from Philadelphia (U.S.A.) will replace Professor Richard D. Keynes from Cambridge (U.K.) as President of ICRO.

For 1983, a total of 8 training courses, to be held in Puerto Rico, Nairobi, Madrid, Santiago (Chile), Stockholm, Dakar, Caracas and Tucuman (Argentina), were approved by the Council.

The programme of lectures included short accounts by Professor Salvador E. Lurita on “ICRO and the Cell Biology after 1960”, by Professor Keynes on the “International Network of Biology”, and by the Secretary General of ICRO, Dr. Adam Kepes, on “the History of ICRO”. There were also two very important conferences, one by Professor Paul Berg from the University of Stanford, California, on the “Expression of Genes Transduced in Mammalian Cells”, the other by Professor Trevor A. Thorpe from the University of Calgary, Canada, on “Plant Tissue Culture and its Impact in Agriculture”. These two lectures illustrated exceptionally well two sides of modern research in biology. The first showed the importance of genetic engineering in grasping the mechanism of gene expression; the second demonstrated the practical application of cell biology in solving the most pressing problems of a hungry world.

E. De Robertis

NEW ASSOCIATION OF SCIENTIFIC EDITORS

A new association of scientific editors was founded on 14 May 1982. The European Association of Science Editors, EASE, is the result of a merger at their conference in Pau, France, between the former European Life Science Editors’ Association (ELSE) and the European Association of Earth Science Editors (EDITERRA).

Besides continuing publication of Earth & Life Science Editing every four months, the new association will expand its programme of regular conferences and workshops. Membership is open to all editors and those working in the dissemination of scientific knowledge.

The first president of EASE is Dr Stephen Lock, Editor, British Medical Journal, and the vice-president Professor Paul Fogelberg, of the University of Helsinki, who is editor of Boreas. Further information may be obtained from the Secretary/Treasurer, Miss Nancy Morris, P.O. Box 33, Farnham, Surrey, GU10 3JX, UK (Tel. 0252 723945).
IUBS BUDGET - 1983

The Executive Committee Meeting, held August 27, 1982 in Ottawa, Canada approved the budget for 1983. This budget will be reviewed at the Officers’ Meeting in 1983 in light of the Union’s financial situation following application of the new National Membership dues schedule adopted at the XXI General Assembly.

1. INCOME

   (in US $)

   1.1. National Member Contributions 180 000
   1.2. ICSU/UNESCO Subventions
       — basic allocation 13 000
       — scientific projects 11 000
   1.3. UNESCO Contracts 10 000
   1.4. Interests & Dividends 7 000
   1.5. Other income 2 000

   Total Income 223 000

2. EXPENDITURE

2.1. Administration

   2.1.1. Offices of the President,
           Secretary General, Treasurer 3 000
   2.1.2. The Secretariat 103 000
   2.1.3. Audit fees 3 000
   2.1.4. Bank Charges 2 000

   Total (administration) 111 000

2.2. Scientific Activities

   2.2.1. Travel expenses of Officers 10 000
   2.2.2. Executive Committee Meeting 25 000
   2.2.3. Publications 20 000
   2.2.4. Dues to other organizations 7 000
   2.2.5. Representation to other organizations 10 000

   Total (scientific activities) 72 000

2.3. Scientific Programme

   2.3.1. Decade of the Tropics 18 000
   2.3.2. Medicinal Plants 5 000
   2.3.3. Biological Education 5 000

   Total (scientific programme) 28 000

2.4. Subventions (Loans)

   2.4.1. The XII Conference of the European Society
           for Comparative Endocrinology
           Sheffield (U.K.), 31 Jul. - 5 Aug., 1983 5 000
   2.4.2. The 2nd Congress of the International Society
           of Developmental & Comparative Immunology
           Los Angeles (U.S.A.), 14-19 Aug., 1983 2 400
   2.4.3. Symposium on Cytology and Hybridization
           in Biosystematics: 40 Years Later
           Montreal (Canada), 17-21 Jul., 1983 2 000
   2.4.4. The Joint Meeting of ETC & EURES
           Budapest (Hungary), 9-14 May, 1983 1 500
   2.4.5. The 8th Malacological Congress
           Budapest (Hungary), 29 Aug. - 3 Sept., 1983 1 500
   2.4.6. The 5th International Symposium on Pollination
           Versailles (France), 27-30 Sept., 1983 1 300

   Total 1983 loans 13 700

   Total expenditure 224 700
THE ART OF ABSTRACTING
This book is a comprehensive guide to writing and editing abstracts of scholarly materials. The author develops three major themes: reading, rules, and relationships. The book will be of special value for scientists in preparing abstracts for their publications and meetings, as well as for scientific and technical libraries.

BIO-ENERGY '80
Published by the Bio-Energy Council (U.S.A.), the Proceedings are reproductions of manuscripts submitted by speakers within the framework of seminars organized on the following topics: biomass sources, conversion processes, programmes and systems, impact analysis and basic research.

INTERNATIONAL BIO-ENERGY DIRECTORY 1981
The directory includes five parts dealing with biomass resources, microbial conversions, thermal conversions, fuel tests and general appraisals. For information, write to: The Bio-Energy Council, 1625 Eye Street, N.W., Suite 825A, Washington, D.C. 20006, U.S.A.

BIOMEDICAL RESEARCH INVOLVING HUMAN SUBJECTS
Published by CIOMS, 1982. (49 pages).
This document includes the proposed guidelines for biomedical research involving human subjects, resulting from a study initiated in 1976 by CIOMS in collaboration with WHO, and endorsed by the WHO Advisory Committee for Medical Research. For information, write to: Z. Bankowski, M.D., Executive Secretary, CIOMS, c/o WHO, CH-1211 Geneva, Switzerland.

MYCOSES
Published by CIOMS, 1982. (47 pages).
This booklet represents part 2 of Volume II of the International Nomenclature of Diseases, which is a joint project of the Council for International Organizations of Medical Sciences and the World Health Organization (WHO). It includes only infectious diseases caused by fungi.

FERTILIZER USE IN INTEGRATED FRUIT PRODUCTION
West Palaearctic Regional Section Bulletin of the IUBS Section for Biological Control, 1982. (64 pages).
This report includes ten papers presented at the meeting of the IOBC Commission held at Chagnins, Switzerland, 2-3 September, 1980, on the topic "fertilizer use in integrated production".

FORESTRY FOR RURAL COMMUNITIES
Published by the Forestry Department of the Food and Agriculture Organization of the United Nations (FAO). (153 pages).
This volume discusses forestry and the development of rural communities, the need for community forestry, policies and projects.

INFLUENCE OF PESTICIDES ON THE BENEFICIAL FAUNA IN FRUIT TREES
West Palaearctic Regional Section Bulletin of the IUBS Section for Biological Control, 1982. (90 pages).
This issue contains 14 research papers presented at a meeting of the IOBC Working Group on Integrated Protection in Orchards held at Colmar, France, 31 March-1 April, 1981.

LIVING IMAGES: BIOLOGICAL MICROSTRUCTURES REVEALED BY SCANNING ELECTRON MICROSCOPY
This book contains over 350 photographs taken with the scanning electron microscope of plants, animals and microorganisms magnified up to 25000 times. Each micrograph is identified and described briefly in non-technical language which makes the book understood by lay persons and students as well.

RESEARCH IN COMMUNITY-BASED BIOLOGICAL EDUCATION
This volume includes four case studies of research undertaken within the framework of the project of the IUBS Biological Education Commission on the biological needs of communities in developing countries, and identifies strategies for relating biological education to community development.

WORLD WILDLIFE FUND (WWF) YEARBOOK 1982
Edited by A. Farrell and published by WWF, 1196 Gland, Switzerland. (490 pages).
The yearbook 1982 represents a review of WWF's conservation activities in 1981 as well as part of 1982. Also included is a selection of national projects from WWF affiliate organizations and a preview of the 1982 Tropical Forest Campaign.