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International Organization of Plant Biosystematists

Newsletter

No. 7

Edited by K. M. Urbanska

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INTERNATIONAL ORGANIZATION OF PLANT BIOSYSTEMATISTS

NEWSLETTER No. 7

CONTENTS

Dear IOPB Members,

Here we go again - a rather varied 7th issue of the Newsletter is born. Cordial thanks for your excellent cooperation.

To begin with, we have an outstanding lead article on 'Old and new aspects of gametophytic apomixis' by Dr. Gian A. Nogler (p. 3). Members working in crop plant breeding, this is also for you. I am very grateful to Dr. Nogler and, of course, ready to publish any of your comments in the next issue of the Newsletter.

Interesting things are going on 'down under'; just see for yourself ('Profile of a Lab', by Dr. R. Bruce Knox from the University of Melbourne, p. 6). Many thanks, Bruce.

It is time to think seriously about nominations for the IOPB Council (p. 11). Since the choice of the Officers is very important to a further development of IOPB, I took the liberty of defining the kind of Council we need and that we probably could do without. Please consider the matter carefully before suggesting nominations, and also later when you receive the ballot.

The report on the IOPB Symposium in Zürich sent in by our Past President Dr. W.F. Grant (p. 11) is written for all IOPB members unable to attend (information), all Members who did attend (reminiscence), and all would-be Members (guess with which purpose).

In the Column 9, we not only have request for material and informations, but also an **offer** of help (p. 16); many thanks to Dr. C.C. Chinappa for this nice innovation - may it become a tradition in this Newsletter.

The International Prize in Biology 1986 went to an IOPB Member (p. 17). We congratulate Dr. Peter H. Raven and hope that another member of our organization will be honoured in the future.

Data for Newsletter No. 8 should arrive here before May 31.

I wish you all a Happy Year 1987

The Editor

NOTE: Please write in capital letters or use typewriter while preparing your 'Research News' sheet for the Newsletter. You don't want to have some words misspelled in print, do you?

2. LEAD ARTICLE

By Gian A. Nogler, Institut für Allgemeine Botanik, ETH-Zentrum, CH-8092 Zürich.

Old and new aspects of gametophytic apomixis

1) Why are gametophytic apomicts polyploid and hardly ever diploid? Diploids occurring in agamospecies are sexual. Nevertheless, gametophytic apomixis is by no means incompatible with diploidy as is shown by the very few known diploid apomicts such as a diploid biotype of Potentilla argentea investigated by MUENTZING (1945). In the apomictic Ranunculus auricomus complex (Auricomi) no naturally occurring apomictic diploids are known (statements in the literature to the contrary are wrong), but in cultivation diploid individuals have been obtained from tetraploid apomicts both by haploid parthenogenesis and by androgenesis, viz. as di-haploids.

A prerequisite for gametophytic apomixis is the production of embryo sacs independently of meiosis. Such unreduced embryo sacs arise by apospory (or, in many apomicts, by diplospory). In Auricomi apospory is due to a **dominant** gene A^+, the recessive wild allele a^+ of which does not contribute to apomixis but functions in the normal embryo sac development. Normal, sexual plants are homozygous for the wild allele a^+, whilst apomictics, with aposporous embryo sac formation, are **heterozygous** for a^+/A^-. The genotype of the aposporous parent used in our crossing (NOGLER 1984) is $a^+a^+A^-A^-$, as could be shown both cytogenetically and by anther cultures. Plants homozygous for A^- are not known. Other factors involved in apomixis, in particular parthenogenesis, are independent from the apospory factore A^- but closely linked. There is good evidence that several other apomicts genetically resemble R. auricomus. Panicum maximum deserves especial mention as here dominancy of apospory and apomixis has been proved by significant segregation ratios (SAVIDAN 1981). Some other apomicts may deviate to a certain extent, especially apomictic Rosaceae with multicellular female archesporia such as Potentilla and Rubus.

An answer to our initial question can be given thanks to an unexpected finding made in Auricomi: The apospory factor A^- is not transmissible by haploid (monoploid, n=x) o or o gametes but only by heterozygous ones (a^+A^-). In spite of its dominance the gene A^- cannot reach homozygosity, but it is not yet clear why gametes lacking the wild allele a^+ are nonfunctional.

Unfortunately, in other apomicts the aposporous (or diplosporous) di-haploids are sterile - if, in fact, they are viable - thus preventing any direct cytogenetic approach. The only exception, to my knowledge, is Parthenium argentatum, investigated by GERSTEL (1950, 1953) whose results I compile in the scheme p. 4.

Gerstel's own interpretation seem to me to be rather far-fetched, but assuming, in analogy to R. auricomus, heterozygosity for the apomictic di-haploids (DH) and non-functioning of haploid gametes carrying a dominant allele for - in this case - diplosporous embryo sac formation, Gerstel's results are self-evident.

On this basis it becomes obvious, at least in Auricomi and Parthenium, why diploid apomicts do not occur: they cannot be formed through hybridization but - if at all - only through haploid parthenogenesis (or androgenesis) from tetraploid facultative apomicts, i.e. as di-haploids.

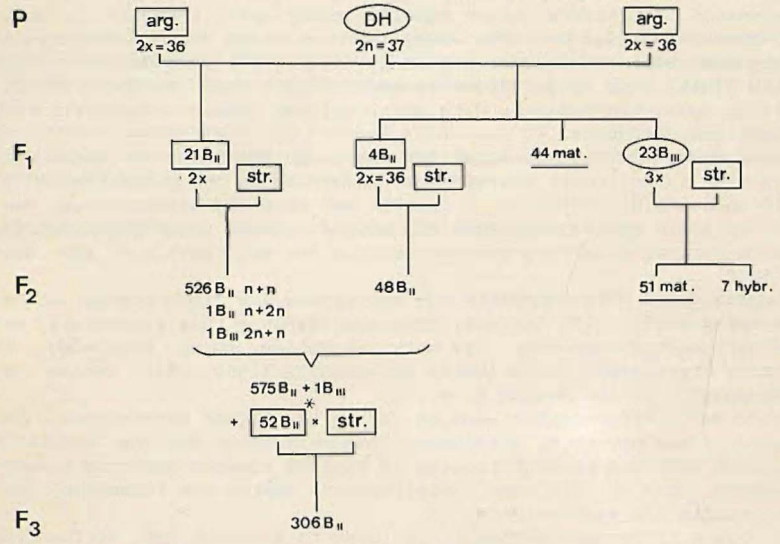
Once formed, such aposporous (or diplosporous) di-haploids ($a^{+}A^{-}$) are usually weak and sterile, or not viable, and only exceptionally they produce a few maternal and hybrid offspring. However, the n+n (i.e. x+x) hybrids are meiotic/sexual ($a^{+}a^{+}$). In other words: at the diploid level apospory can, at most, be maintained by maternal reproduction (2n+o), i.e. apomictically, but not by hybridization (n+n). No sexual recombination is possible at the diploid level; here apomixis is really a blind alley of evolution - contrary to polyploid apomicts. However, such aposporous di-haploids, even if they are weak and poorly fertile, may play a certain role in quite another respect: after pollination by reduced pollen of tetraploid apomicts in the vicinity they may directly give rise to new tetraploid plants, which may, in turn, directly or indirectly give rise to new tetraploid apomictic biotypes. In 1968 DE WET proposed an evolutionary model within agamospecies: 'diploid-tetraploid-haploid cycles'. In the variation of such a cycle presented here aposporous di-haploids, rather than sexual diploids, serve as intermediate stages between tetraploid biotypes.

PARTHENIUM ARGENTATUM arg.
sexual 2x = 36
apomictic: 4x = 72
→ 2x = 36,37 dihaploid (DH)

PARTHENIUM STRAMONIUM str.
sexual, 2x = 36

Phenotype: sex. 2x
apom. 2x, 3x

B_{II} hybrid: n + n
B_{III} hybrid: 2n + n
maternal : 2n + o



*) 52 B_{II} from 15 different F_1 – B_{II} inter se

2) Why do crosses between two highly apomictic plants yield, besides maternal offspring, sometimes purely sexual hybrids? This is another embarrassing observation which becomes easily explainable when assuming conditions analogous to those found in Auricomi, viz. a dominant allele causing apospory (A^-) obligatorily present in heterozygous condition. Then, the origin of such sexual hybrids, lacking apospory, is simply explainable by mere recombination of recessive wild alleles, e.g. a+a+A-A- x a+a+a+a+ → a+a+a+a+. Such sexual hybrids are, of course, just as heterozygous as their apomictic parents (except for a^+) and, therefore, not true breeding. After crossing with apomicts they may, directly or indirectly, give rise to new competitive apomictic biotypes, provided their degree of apomixis is sufficiently high. In this particular mechanism of evolution within agamospecies the intermediary stages between apomictic biotypes are sexual hybrids having the **same** level of polyploidy.

In general, hybrids are usually less vigorous than their apomictic parent(s) but, exceptionally, certain heterozygous gene combinations may cause more vigorous and highly competitive phenotypes. The most striking instance demonstrating this vigour are heterosis after crossing certain inbreeding lines. Although heterozygosity is not compatible with sexual reproduction, its favourable effects are to some extent made use of in polyploids and in translocation (complex) heterozygots (which take into the bargain enormous complications of meiosis and often a restricted fertility). Apomixis (agamospermy) is the only mode of reproduction by seed which allows fixation of any given heterozygous gene combination, and the well-known superiority of most apomictic biotypes is a striking example of the positive effects of heterozygosity. Gametophytic apomicts have, in addition to the manifold protective mechanisms warranted by seeds, another decisive advantage as compared to vegetative propagation: They have an alternation of generations, but their alternation of nuclear phases (which normally parallels the former) is by-passed on the female side, due to suppression of both meiosis (before embryo sac initiation) and fertilization (before embryo initiation). However, this suppression is not always total so that sexual recombination is not entirely excluded in gametophytic apomicts. This assures a minimal but obviously sufficient adaptability which is usually realized by one of the two evolutionary mechanisms within agamospecies just alluded to.

If heterozygosity and heterosis effects should be reproducible by seeds in sexual crop plants this would necessitate the transfer of apomixis genes into normal plants. Hence the increasing practical interest in apomixis by plant breeders, which has recently been discussed in a 'Conference on the potential use of apomixis in crop improvement' organized by the Rockefeller Foundation. Programs for exploiting apomixis will, no doubt, necessitate painstaking and time-consuming investigations and crossings. Before this is achieved, and promoted by practical need, advances are to be hoped for in basic research, as many gaps are still to be filled up in our theoretical knowledge.

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between sexual and apomictic Potentilla argentea. Bot.Not. 1945, 237-278.
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3. PROFILE OF A LAB

by Prof. R. Bruce KNOX, Plant Cell Biology Research Centre, School of Botany, University of Melbourne, Parkville, Vic. 3052, Australia

This Centre carries out basic research in plant cell biology, with goals of applying the research to practical problems in plant breeding and biotechnology. It is housed in the School of Botany, and was set up by the Australian government in 1982 under the direction of Professor Bruce Knox and Adrienne Clarke. Two different but complementary groups have been established:
Reproductive Biology: to investigate the cytology and physiology of reproduction and the control of fertilization (Prof. Knox);
Molecular Biology: to investigate the molecular basis of recognition in fertilization and pathogenesis (Prof. Clarke).
This report concerns the research projects within the Reproductive Biology group. The research strategy has been to develop a range of technologies appropriate to problem solving in the reproductive biology of crop and native plants in Australia. These include a special emphasis on microscopic technologies using differential interference and fluorescence microscopy, scanning and transmission electron microscopy together with new developments in computer-assisted morphometry and three dimensional-reconstruction technology (in association with the Computer-Aided-Engineering Design Centre of the University's Faculty of Engineering), and video microscopy and digital image processing. Cytochemical approaches are also emphasized, with established skills in enzyme cytochemistry, immunocytochemistry (especially monoclonal antibody technology). Recently, increasing importance has been placed on the development of techniques to estimate pollen viability, and thermogravimetry and pollen freezing and storage technology has been established. Cell fractionation facilities have been set up for sperm cell isolation from pollen, and facilities for studies of gene expression in pollen. The focus of the research has been increasingly on pollen biology and biotechnology. Staff of the Centre has varied from time to time, but generally there has been support for three research fellows with appropriate support staff. The Centre has been fortunate to attract several Visiting Research fellows each year from overseas and within Australia. The Centre has hosted three international conferences, 'Pollination' 1982, 1984 and 1986 to further its aims of providing a focus for research in plant reproductive biology in Australia. In the area of fundamental research, the group has concentrated its work in two broad areas: 1) **Control of fertilization**, including pollination mechanisms, timetable of fertilization, nature of the breeding system, and physiology of self-incompati-

bility including pre- and post-zytogotic barriers, embryo cloning and in vitro fertilization; 2) **Pollen structure and function**, including pollen viability estimation, pollen storage and germ plasm collection, pollen gene expression and the isolation and cell biology of the sperm cells and their progenitor, the generative cell. Several experimental systems are employed for these studies: 1) Crop plants: Brassica campestris, B. napus, B. oleracea; Lolium perenne and other grasses; Lacopersicon peruvianum, Rhododendron spp. (especially Vireya) and various legumes. 2) Australian species: Acacia retinodes and other spp. (Leguminosae, Mimosoideae); Acrotriche (Epacridaceae); and Thryptomene (Myrtaceae).

Selected publications:

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BEATTIE A.J., TURNBULL C., HOUGH T., JOBSON S. and KNOX R.B., 1985: The vulnerability of pollen and fungal spores to ant secretions: evidence and some evolutionary implications. Amer.J.Bot. 72, 606-614.

BERNHARDT P., KENRICK J. and KNOX R.B., 1984: Pollination biology and the breeding system of Acacia retindes (Leguminosae: Mimosoideae). Ann.Miss.Bot.Gard. 17, 17-20.

BERNHARDT P. and WALKER W., 1984: Bee foraging on three sympatric species of Australian Acacia. Int.J.Entomology 26(4), 322-330.

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THIEN L.B., NERNHARDT P., GIBBS G.W., PELLMYR O.M., BERGSTROM G., GROTH I. and McPHERSON G., 1985: The pollination of Zygogynum (Winteraceae) by a moth, Sabatinca (Micropterigidae): an ancient association? Science 227, 540-543.

WILLIAMS E.G., ROUSE J.L. and KNOX R.B., 1985: Barriers to sexual compatibility in Rhododendron. Notes Roy.Bot.Gard.Edinb. 43, 81-98.

WILLIAMS E.G. and MAHESHWARAN G., 1986: Somatic embryogenesis: factors influencing coordinated behaviour of cells as an embryogenetic group. Ann.Botany 57, 443-462.

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4. RESEARCH NEWS

CHEN Jiakuan, Ph.D., Department of Biology, Wuhan University, Wuhan, China.
Recent publications:
Note of the Editor: Numerous articles on aquatic plants have been published. They are not listed here as we hope being able to publish a 'Profile of Lab' in the next issue of the Newsletter.
Projects completed:
Systematic study on Alismataceae in Hubei.
Projects started:
A biosystematic investigations on Sagittaria (Alismataceae) in China.

CHINAPPA C.C., Dr., Dept. of Biology, University of Calgary, Calgary, Alberta, CANADA T2N 1N4, has studied chromosome numbers in species of Antennaria collected on a 1986 summer field trip to the Arctic. Chromosome numbers were determined for many specimens collected from a variety of sites in Northwest Territories and Yukon territory, Canada, and from sites in Alaska, U.S.A. Also, several genotypes of Stellaria longipes Goldie were collected. The species of Antennaria studied include A. isolepis Green, A. alaskana Malte, A. neoalaskana Porsild, A. Ekmaniana Porsild, A. pallida E.Nels., A. atriceps Fern., A. philonipha Porsild, A. monocephala DC, and A. densifolia Porsild.

HEYN Chaia Clara, Prof., Dept. of Botany, The Hebrew University, Jerusalem 91904, Israel.
Recent publication:
HEYN C.C. and SNIR S., 1986: Selfing and pollen allocation in some Asteraceae. Prof.Roy.Soc.Edingb. 89B.
Projects completed:
Pollination, breeding system and stigma development in some Leguminosae.
Projects started:
A moss flora of Israel (with I. Herrnstadt). Cytotaxonomic studies in Adonis. Several pollination projects.

LARSEN Kai, Prof., Botanical Institute, University of Aarhus, 68, Nordlandsvej, DK-8240 Risskov, Denmark.
Projects started:
Biosystematics of mediterranean Cruciferae.

MONTSERRAT-MARTI, Joseph M., Dr., Director of the Botanical Institute, Av. dels Muntanyans s/n, Parc de Monthuic, 08004 Barcelona, Spain.
Recent publications:
Several articles in Collectanea Botanica, Anales Jard.Bot.Madrid, Lejeunia, etc.
Projects completed:
Flora of the 'Sierra de Guara', Pyrenees, Spain.
Projects started:
Flora of meridional Pyrenees. Revision of mediterranean species of Puccinellia (Gramineae).

PICHI SERMOLLI Rodolfo E.G., Prof., Via Cantagrilli 1, I-50020-Montagnana Val di Pesa (Firenze), Italy.
Recent publication:
1986: Iconographia Palynologica Pteridophytorum Italiae. Webbia 40, 1-202.

Projects started:
Revision of the Italian Pteridophyta.

PING-SHENG Hsu, Prof., Department of Biology, Fudan University, 220 Handan Lu, Shanghai, People's Republic of China, is Member of the standing committee of Botanical Society of China; Curator of the Department of Botany, Shanghai Museum of Natural History; Member of IPCN; Member of both the editorial boards of 'Flora Republicae Sinicae' and 'Acta Phytotaxonomica Sinica'.
Projects completed:
1) A numerical analysis of the distributional pattern of Chinese Viburnum. 2) Karyological and cross breeding studies on genus Lycoris.
Projects started:
1) Further karyological studies on genus Lycoris.
2) A biosystematic study on some Chinese taxa of Mosla.
Publications:
Altogether 92 articles, of which about 60 dealt with plant biosystematics were published.
1986:
- The objective reality of species. Acta Bot.Yunnan 8(2), 229-238.
- Karyological studies on Cunninghamia unicanaliculata and var. pyramidalis. Acta Bot.Sin. 28(2), 150-155.
- The significance of ecological variation in plant taxonomy and evolution. Guihaia 6(3), 201-216.
- An evaluation of the interspecific relationships of Lycoris based on pollen viability and rate of seed-set after crossing. Acta Genet.Sin. 13(5), 369-276.
- The methodology in biological classification. Nature (China) 9(2), 113-118.
- Chromosome observations of eight species endemic to China. Acta Phytotax.Sin. 24(2), 157-160.
- A karyotypical study on Notholirion bulbiferum. Guihaia 6(1-2), 95-98.
- Karyotype analysis in Camellia polyodonta How ex Hu. Guihaia 6(1-2), 107-110.
- Recent progress in historical biogeography. Exploration of Nature 5 (3), 107-114.

VALLES-XIRAU Joan, Prof., Dept. of Botany, Faculty of Pharmacy, University of Barcelona, Zona Universitaria de Pedralbes, 08028 Barcelona, Spain.
Recent publications (1985):
VALLES-XIRAU J.: Artemisia chamaemelifolia Vill., nueva especie para la flora andaluza. Fontqueria 8, 1-3.
VALLES-XIRAU J.: Artemisia ramosa Ch.Sm., nouvelle espèce de la flore marocaine. Saussurea 16, 39-41.
VALLES-XIRAU J.: Sobre el area de dispersion de Artemisia tournefortiana Reich. en la peninsula Iberica. An.Jard.Bot.Madrid 42(1), 254-255.
VALLES-XIRAU J.: Proleg a N. Fages de Roma: Cartilla rural en aforisme catalans. Edicio fascimil. Dept.Agric.Gen.Catalunya i Diputacio de Girona.
VALLES-XIRAU J., BENEDI C. and FERNANDEZ C.: La biosistematica, amb especial atencio a la citotaxonomia, als Paisos catalans. Bull.Inst.Catalana Hist.Nat. 50, 327-334.
VALLES-XIRAU J. and FERNANDEZ C.: Camphorosma (Chenopodiaceae) en Jaén. Blancocoana 3, 103.
VALLES-XIRAU J., BLANCHE C. and BENEDI C.: Chromosome number reports 87. In: LOEVE A. Taxon 34(2), 349.

Projects completed:
Biosystematic revision of sections Artemisia and Seriphidium Bess. of the genus Artemisia L. (Asteraceae, Anthemideae) in Iberian Peninsula and Balearic Isles.
Projects started:
Biosystematic revision of sections Absinthium DC. and Dracunculus Bess.

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5. IOPB COUNCIL ELECTION

Call for nominations (by W.F. Grant)
A Nominating Commitee has been established to solicit names for a mail ballot for Vice-President and ten Council members (no more than two persons from any one country). The Nominating Committee consists of B.A. Barlow (Australia), E. Pogan (Poland), I. Fukuda (Japan), C.A. Stace (Great Britain), D. Cartier (France), K.L. Chambers (U.S.A.), C.C. Chinnappa (Canada) and the Executive ex officio (K. Urbanska, Zurich; L. Borgen, Oslo, W.F. Grant, Montreal). Send suggestions of names to any member of the Nominating Committee or Executive. A ballot will be sent out prior to the International Botanical Congress and the names of the new Executive and Council Members will be announced at en Open Meeting on IOPB during the Botanical Congress (Berlin, 24 July to 1 August 1987).

NOTE:
The kind of people we do need for the Council:
- Busy scientists who are all the same prepared to give some of their time to IOPB. This means: a) to write and mail a letter or two (three); b) to contact other Council Members, should any important matter be discussed; c) to think (from time to time, preferably between the meals) about things that should be improved in the structure or activities of the IOPB.

The kind of people we don't need for the Council:
- Busy scientists who are unable to spare some time, to write and mail letters (or have them written and mailed) etc. etc.

Do you agree?

The Editor

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6. THE IOPB SYMPOSIUM 1986, ZURICH

by William F. Grant, Department of Plant Science, P.O. Box 4000, Macdonald College of McGill University, Ste. Anne de bellevue, Quebec, Canada H9X 1CO.

Participants from 26 different countries attended the five day symposium 'Differentiation Patterns in Higher Plants' organized by Krystyna Urbanska and held at the Eidgenössische Technische Hochschule (ETH), Zurich, Switzerland. The Symposium included 15 papers by invited

speakers, three poster sessions, a half day field trip to Uetliberg mountain, and a full day field trip to Davos to study subalpine and alpine vegetation. Both field trips were led by Prof. E. Landolt, ETH Zurich.

A brief summary of the topics of the 15 Invited Papers is as follows:

F.A. BAZZAZ, Harvard University, Cambridge: **The maintenance of ecological and genetic variation in plant populations.** Prof. Bazzaz emphasized the importance of distinguishing between genetic and ecological variation. Ecological variation may be readily assessed experimentally and interpreted in terms of plant success in particular environments and can operate to maintain genetic variation with possible evolutionary consequences. There are a number of environmental factors that affect plant fitness, such as size, seedling growth, herbivory, life history, apomixis that may oppose selection and maintain genetic variation in a population.

A.D. BRADSHAW, University of Liverpool, U.K.: **Chance, space and time in plant evolution.** After an update on his pioneering studies on evolution of metal and salt tolerance in plants, Prof. Bradshaw demonstrated how, normally, natural selection can assemble appropriate constellation characters very rapidly. Such evolution can be extremely localized. However, the process is totally controlled by the presence of appropriate variability so that evolution may either not occur at all or only proceed a short distance.

C.D.K. COOK, University of Zurich, Switzerland: **Vegetative growth and genetic mobility in some aquatic plants.** Prof. Cook discussed the 12 most notorious invaders of aquatic habitats. Of these, only two are annuals reproducing sexually, whereas the others rely on vegetative reproduction. The dioecious species possess extreme capabilities for non-cohabitation.

D.J. CRAWFORD and T.F. STUESSY, Ohio State University, Columbus: **Patterns and processes in the evolution of floras of oceanic islands.** Prof. Crawford presented the results of a comparative systematic study being carried out on congeneric species on oceanic islands. He stated that factors which isolate species are largely premating with adaptive radiations of the species into a variety of habitats, in contrast to postmating isolation factors chromosomal or genetic in nature which are weak or non-existent. Isozyme and chloroplast DNA studies reveal little or no variation suggesting recent divergence. Island species may occupy a diversity of habitats and profound morphological differences, yet be highly infertile and non-divergent in molecular adaptive radiation.

F. EHRENDORFER, University of Vienna, Austria: **Differentiation trends in tropical woody angiosperms.** A number of examples of the variation and differentiation which is occurring in some tropical woody angiosperms were presented by Prof. Ehrendorfer. These involved: a) life and growth forms, b) flower and fruit biology, c) phytochemical information, d) cytological data, and e) data on hybridization and size of populations. All these factors play a role in the evolution of woody angiosperms and must be considered in arriving at a conclusion.

W.F. GRANT, McGill University, Montreal: **Genome differentiation in higher plants.** Prof. Grant reviewed various aspects of the genome and its role in systematics stressing information derived from cytogenetical and molecular techniques. Discussions concerned chromosome markers, genetic differences of allopolyploids arising from repeated hybridization, genome orientation in hybrids, chromosome banding, nucleotypic associations, discrepancies in nuclear DNA values in polyploids, and the more recent use of molecular approaches to systematics, such as restriction endonuclease mapping.

J.L. HAMRICK, University of Georgia, Athens: **Gene flow and the distribution of genetic variation in plant populations.** The question of gene flow and some of the different means for its measurement were discussed by Prof. Hamrick. Great variability in gene flow. Considerably more study is required on gene flow using techniques which have become available in the last few years.

S. KAWANO, Kyoto University, Japan: **Life history evolution in temperate woodland plants.** Prof. Kawano described the four life history characteristics of temperate woodland herbs in eastern North America and Japan which account for the evolutionary trends in species. The species studied included Erythronium japonicum, E. americanum, Fritillaria koidzumiana, Trillium species, Cardiocrinum cordatum, Disporum species, Uvularia species, Medeola virginiana and Allium monanthum.

R.B. KNOX, University of Melbourne, Parkville, Australia: **Pollen differentiation patterns and male functions.** Prof. Knox discussed the role of the male (pollen) in terms of **reproductive effort** which can be estimated by the size and mass of seeds produced by a given pollen parent and **reproductive success** which estimates the rate of success of an individual plant in fathering as many viable embryos as possible. The latter can be determined by pollen quantity and quality, cytology, pollen germination, tube growth rates, success of fertilization and effectiveness of the sperm cells.

E. LANDOLT, Geobotanisches Institut, ETH, Zurich: **Eco-geographical differentiation in some aquatic plants: the Lemnaceae.** The special evolutionary features of the Lemnaceae were discussed by Prof. Landolt. The most prominent is a reduction in plant size and morphology. Specialized pathways include: 1) resting buds (turions), 2) ability to grow at cool temperatures, 3) production of drought-resistant seeds, and 4) the development of a submerged habitat to avoid extreme temperatures and better access to nutrients. As a result the species have colonized nearly all climates and regions of the world.

D.F. MURRAY, University of Alaska, Fairbanks: **Modes of reproduction and speciation in the arctic flora of North America.** Prof. Murray reviewed the subject of arctic adaptation by plants. He stressed that high frequencies of apomicts and asexual reproduction which is postulated to explain the assured success of plants in regions where short, cold summers limit reproductive success, is not valid for the arctic flora as a whole. The hig frequency of polyploids (up to 80%) must be the result of stabilized hybrids which allow apomicts to arise. The process is less a direct response to the environment than a legacy of Quartenary history. The arctic is anything but a uniform environment and the production of diverse genotypes would most likely result from genetic recombination through the sexual process.

J.A. QUINN, Rutgers University, Piscataway, N.J.: **Complex patterns of genetic differentiation and phenotypic plasticity vs. an outmoded ecotype terminology.** Prof. Quinn discussed the origin and different usages of the term 'ecotype'. He considered that the Turesson ecotype is neither an ecological nor an evolutionary unit. Each combination of gene pool and environmental condition is unique, giving rise to a population potentially unpredictable in certain of its properties. The grouping of genotypes and populations into ecotypes on the basis of physiological and morphological characters may also ignore genetic differentiation in phenotypic plasticity against a range of environments. The relative amount of plasticity and/or differential population responses are a function of the specific environments to which populations are exposed. Phenotypic differences among sites may be population specific adaptive products of the local genotype-environment interaction, disappearing under controlled or common environments.

C.A. STACE, University of Leicester, U.K.: **Natural hybridization and the plant species.** Prof. Stace reported that hybridization in the wild is extensive and could exceed 70,000 interspecific combinations. Since very few hybrids are completely sterile, hybridization must be considered an integral part of the normal pattern of variation in flowering plants per se or via a bridging effect on various polyploid levels leading to various evolutionary pathways. An examination of this phenomenon can best be taken through the experimental and retrospective approaches.

P.P.E. VERNET, Université des Sciences et Techniques de Lille, Villeneuve d'Ascq Cedex, France: **Genetic structure and diversity patterns between adjacent populations in Arrhenatherum elatius.** Prof. Vernet reported on the genetic structure and genetic diversity of populations of Arrhenatherum elatius on normal and mine soils. The highest heterozygote deficiency was noted in the more dense populations, presumably due to more limited gene flow. By allozyme markers genetic diversity on toxic soils is higher, suggesting the presence of tolerant types in normal populations. Selective forces, breeding systems combined with population size, and taxon history are important factors for higher genetic diversity in toxic habitats.

J. WHITE, University College Dublin, Ireland: **Demographic consequences of modular differentiation in plants.** Prof. White discussed the various forms of modular construction into which shoots may differentiate - from plants with single shoot apices to those with thousands of apical meristems. He pointed out that the genetic basis of modular differentiation is poorly understood and comparison between closely related taxa which show variation in patterns of modular construction are needed to resolve these questions.

A unique feature of the meeting was three sessions devote to discussions on the posters. Time was allowed for the discussion of each poster, and abstracts of the posters made the discussions most successful.

Like the preceding IOPB 1983 Symposium in Montreal, IOPB 1986 in Zurich helped to weld friendships and initiate collaboration in research especially between field and laboratory oriented workers. 'Biosystematics' is still very much alive.

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7. MINUTES OF THE LAST IOPB BUSINESS MEETING

An open IOPB business meeting was held in Zurich on the last day of the IOPB Symposium. The President, Prof. William F. Grant, McGill University, Montreal, told of the continued interest in the activities of IOPB and the many favourable comments he had received on the holding of IOPB Symposia. He also stated that he had been receiving very high praise for the IOPB Newsletter and for the information gathered for the Newsletter from the botanists around the world.

Dr. Liv Borgen, Secretary-Treasurer, reported that membership was steadily increasing and stated that she looked forward to many more new members as additional activities were undertaken. Membership fees for the three years 1987-1989 (between Symposia and change of Executive) is U.S. Dollar 20. New members and renewals of membership should be sent directly to Dr. Liv Borgen, Botanical Garden and Museum, University of Oslo, Trondheimsveien 23B, 0562 Oslo 5, Norway.

Prof. Krystyna Urbanska, Editor of the IOPB Newsletter, said that issue No. 6 had just been distributed and that any contributions for Newsletter No. 7 should be sent to her before November (Prof. K. Urbanska, Geobotanisches Institut ETH, Stiftung Rübel, Zürichbergstrasse 38, CH-8044 Zürich, Switzerland). Members of IOPB automatically receive the Newsletter.

Prof. C.A. Stace, Department of Botany, University of Leicester, Leicester LEl 7RH, U.K.) stated that the IOPB Newsletter would be an excellent place to report genomic and cytogenic data, such as DNA density measurements, nucleotypic associations, species which have special chromosome markers, species on which chromosome banding, restriction mapping, etc. are being carried out, in addition to chromosome numbers of species and hybrids. He offered to collect data and compile for the Newsletter. Please send your data to Prof. Stace for inclusion in the next IOPB Newsletter.

An invitation has been accepted by the Japanese Botanists to hold the next IOPB Symposium in Japan. Prof. S. Kawano, Department of Botany, Kyoto University, stated that the Symposium would be held in Japan in 1989 and that he would be working with his botanical colleagues to make it a highly successful meeting. Details concerning 'IOPB 1989' Symposium will be published in the IOPB Newsletter.

Under future items for IOPB to consider, Prof. F. Ehrendorfer, Botanical Institute, Vienna, stated that IOPB might sponsor 'Workshops on Techniques', such as advances in cytology, electrophoresis, etc., and that he would be willing to hold a one week workshop on cytological techniques at his Institute. Anyone interested in participating or holding a workshop is requested to write to Prof. Grant who will try to coordinate such a workshop.

The Executive and Council have decided to shorten the term of office of the Executive and Council from between International Congresses of Botany (five to six years) to between IOPB Symposia which are now being held every three years. As a result, a Nominating Committee was established to solicit names for a mail ballot for Vice-President and ten Council members (see also p. 11).

The Executive considered that an 'Award' be presented to an outstanding 'Biosystematist' at the next IOPB Symposium in japan. The Nominating Committee was charged also with this task. Names for considerations should be sent to any member of the Nominating Committee or the Executive.

Finally, the President turned the meeting over to the incoming President, Krystyna Urbanska.

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8. PUBLISHING NEWS

JACQUARD P., HEIM I. and ANTONOVICS J., 1985: Genetic differentiation and disposal in plants. NATO ASI, Series G. Vol. 5. Springer, Berlin/ Heidelberg/Tokyo. 453 pp. Available in hardcover.

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9. REQUESTS FOR MATERIAL AND INFORMATIONS

CHEN Jiakuan, Ph.D., Department of Biology, Wuhan University, Wuhan, China, would appreciate some specimens and seeds of Sagittaria from Europe and America.

MONTSERRAT-MARTI, Joseph M., Dr., Director of the Botanical Institute, Av. dels Muntanyans s/n, Parc de Monthuic, 08004 Barcelona, Spain, would appreciate seeds and herbarium sheets of Puccinellia.

PING-SHENG Hsu, Prof., Department of Biology, Fudan University, 220 Handan Lu, Shanghai, People's Republic of China, would appreciate research material of Lycoris from many countries, including Czechoslovakia, Hungary, Japan, Poland and Switzerland.

STAHEVITCH A.E., Dr., Biosystematics Research Institute, Saunders Building, Central Experimental Farm, Ottawa, Ontario, Canada K1A 0C6, would appreciate seed samples of Matricaria maritima and M. perferota for a biosystematic study.

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Writes Dr. C.C. CHINAPPA, Dept of Biology, University of Calgary, 2500 University Drive NW, Calgary, Alta, Canada T2N 1N4:
"A field trip to the Arctic has been scheduled for the summer 1987. The objective of this trip will be to reinvestigate areas previously sampled in 1986 and, as well, to investigate parts of the high Arctic including the Brooks Range and Prudhoe Bay region, Alaska and, if possible, the British Mountains and high Arctic slope of the Yukon territories. The collection of live specimens of Antennaria and Stellaria will be the objective of this trip. **If anyone wants seeds of plant material from these areas please let me know by May 1987.**"

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10. MISCELLANEOUS NEWS

Prize

The International Prize for Biology was instituted in 1985 by the Committee on the International Prize for Biology sponsored by the Ministry of Education, Science and Culture, Japan, and the Japan Society for the Promotion of Science. The speciality for the 1986 Prize was Taxonomy or Systematic Biology. Coincidently with the awarding of the Prize, an international symposium on 'Evolution and Coadaptation of Biotic' was held in Tokyo under the support of the Ministry of Education, Science and Culture. The winner of the Prize was Dr. Peter H. Raven, Director of Missouri Bot. Garden.

Changes of address

Dr. Kent E. Holsinger, formerly of Standford University is currently working at
Department of Ecology and Evolutionary Biology
The University of Connecticut, U-43
75, North Eagleville Road
Storrs, CT 06268

Numerous Japanese colleagues have recently moved. The list of current addresses includes:

Hisanori Jin
Ikeda Touka Kougyou K.K.
Mino-oki-cho, Fukuyama
Hiroshima, 721

Kunio Kato
Nippon Tobacco Inc.
R and D Division, 2-2-1
Toranomon, Minato-ku
Tokyo, 105

Shiro Komatsu
Department of Agriculture
Hokkaido University
Kita 9, Kita-ku
Sapporo, 060

Yoshiaki Kon
Oomori High School
Kamata 2-2-1
Ohta-ku
Tokyo, 144

Toshihiro Kugimiya
Imoto Ika Kikai, 5-3-27
Tachibana-dori-nishi
Miyazaki, 880

Tsuneo Machida
K.k. Imagica
Sirite 3-9-28
Tsurumi-ku
Yokohama 206

Kensuke Nabeta
Department of Agicultural Chemistry
Obihiro University of Agriculture and
Veterinary Medecine
Obihiro, 080

Taketo Nishimaki
Department of Bacteriology
Shinshu University
School of Medicine
Asahi 3-1-1-, Matusmoto
Nagano, 390

Hamako Sasamoto
(changed from Hamako Obata)
701-32, Nishiya
Hodogaya-ku
Yokohama, 240

INTERNATIONAL ORGANIZATION OF PLANT BIOSYSTEMATISTS

Executive and Council

President (1986-1989): Prof. Krystyna Urbanska, Geobotanisches Institut ETH, Stiftung Rübel, Zürichbergstrasse 38, CH-8044 Zürich, Switzerland

Past President (1986-1989): Prof. William F. Grant, MacGill University, Montreal, Canada.

Vice-President: To be elected 1987.

Secretary/Treasurer (1981-1989): Dr. Liv Borgen, Botanical Garden and Museum, University of Oslo, Trondheimsveien 23B, 0562 Oslo, Norway.

Members of Council (1981-1987):

Dr. B.A. Barlow, Canberra, Australia

Dr. J. Contandriopoulos, Marseille, France

Dr. I. Fukuda, Tokyo, Japan

Dr. J. Grau, München, West Germany

Dr. P. Küpfer, Neuchâtel, Switzerland

Dr. C. Ochoa, Lima, peru

Dr. E. Pogan, Krakow, Poland

Dr. M.A. Powell, Alpine, Texas

Dr. J.C. semple, Waterloo, Canada

Dr. C.A. Stace, Leicester, England

Please write legibly
(Typewritten or capital
letters)

P E R S O N A L D A T A C O L L E C T I O N

For the International Organization of Plant Biosystematists Newsletter
(IOPB Newsletter)

.....
Last name First name (Mr., Mrs.) Title

Address:

Personal News:

Recent publications:

Projects completed:

Projects started:

Request for research material:

Articles and longer reports, reports of meetings, etc., to be attached:

Please return to: Dr. Krystyna M. Urbanska, Editor, IOPB Newsletters
Geobotanisches Institut ETH
Zürichbergstr. 38
CH-8044 Zürich
Switzerland