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The Relationship between Taxonomy and Chemical Data*

By Rudiger Mues

DURING THE LAST TWENTY YEARS, the number of papers on the "Chemistry of bryophytes" has been increasing rapidly, as shown by the graph of development in this field of research given by Huneck (1983). Today there may exist about 500-600 papers on chemical constituents of bryophytes and so it becomes more and more difficult for phytochemists, and certainly for taxonomists, to evaluate these data. Several review articles are available summarizing the results, only the most recent being cited here: Markham & Porter (1978); Zinsmeister & Mues (1980); Spencer (1979, 1980); Asakawa (1982a) and Huneck (1983). In these reviews the compounds are mainly arranged into several compound classes but the taxonomist, who is not so familiar with natural products, may hardly be able to use them for the solution of his special problems.

Likewise, most of the individual papers, written mainly by chemists or pharmacologists (with or without collaboration from botanists, e.g. Markham et al (1976a); Campbell et al. (1979); Mues (1982a) and Asakawa (1982b)) describe the isolation and identification of new compounds. As has already happened for several decades with cormophytes, discussion is more often than not limited to their chemical and pharmaceutical properties with little or no mention of their possible systematic significance.

As in the case of all new fields of research, classical systematists and taxonomists have at first been sceptical about attempts to introduce new characters. However, more and more papers are now appearing as a consequence of co-operation between phytochemists and taxonomists, e.g. Koponen & Nilsson (1978); Asakawa et al. (1981); Inoue et al. (1981); Gradstein et al. (1981) and Mues et al. (1984). From such collaboration the phytochemist is immediately made aware of the most important and urgent problems and obtains appropriate and correctly determined plant material to start his investigations. The taxonomist, well informed of the nature of phytochemical analyses, is thus readily able to assimilate these new data.

The unequivocal condition of chemotaxonomy is that *a compound must represent a stable character*. This means that the biosynthesis of such a compound must be genetically controlled and is not altered by environmental conditions. The following discussion considers some of the factors which must be taken into account when using chemical data for taxonomic purposes.

1. Compound Class

Organic chemical plant constituents are classified into primary and secondary plant products. Proteins, carbohydrates and lipids are primary products; terpenoids, flavonoids, alkaloids and others are regarded as secondary products. In general primary products are virtually ubiquitous within any particular group of plants. So far only a limited number of primary plant products, often with modified structures, have been used as marker substances in bryophyte taxonomy. These have been most valuable for distinguishing between specific and subspecific ranks, e.g. Lewis (1970); Christie et al. (1981); Krzakowa & Szweykowski (1977); Krzakowa (1978) and Szweykowski et al. (1981b). On the other hand, secondary plant products, because of their discontinuous distribution between groups, have proved to be more useful for chemotaxonomic purposes at several levels in the taxonomic hierarchy. To date, in bryophytes, terpenoids and phenolics have been used most widely as chemotaxonomic markers. [Contd.p 2]

* Contributions to the RESEARCH AND DEVELOPMENT COLUMN Column Editors: R. Mues & J.G.Duckett. For addresses: see Bryol.Times, 31:9.

Chromosome Banding in Bryophytes *

By M.E. Newton

THAT CHROMOSOMES are not uniform throughout their length is well known. Centromeres and nucleolar organizers provide obvious evidence of this, as does differential condensation relating to the presence of heterochromatin, as well as euchromatin. However, where centromeres do not appear as primary constrictions, as in bryophytes, these features are difficult to locate accurately because to do so would necessitate the correlation of observations made during prophase and anaphase of mitosis with chromosome dimensions determined at metaphase. Moreover, the cytological markers which they provide are often inadequate for comparative purposes in bryophytes, and are particularly so in liverworts.

These problems may now be largely overcome by the use of modern chromosome banding techniques developed during the last sixteen years. Each technique identifies, as similarly stained segments or bands, regions of the chromosomes which have some feature of their sub-structure in common. They serve as highly efficient probes of variation in the conformation and molecular composition of chromatin at the light microscope level. As a result, chromosome banding has changed the whole course of higher plant and animal cytology, including its medical aspects, and has been shown to be particularly effective in bryophyte studies. It is, therefore, surprising that bryologists have been slow to adopt techniques which other cytologists use routinely. Part of the reason is perhaps due to misunderstanding; two of the three techniques listed by Ramsay (1983) are essentially identical and the third is not a banding technique as generally recognized. There is also a belief that many bryophyte chromosomes are too small to make

[contd.p. 4]

Taxonomy & Chemical data (contd. from p.1)

2. Plant Material

The most important feature of plant material used for chemotaxonomic work is that it be correctly identified. Especially with difficult genera such as *Plagiochila, Radula, Frullania, Bryum, Campylopus, Sphagnum* or samples from bryologically poorly known regions, determinations should be made or at least checked by a specialist before the phytochemist starts his investigation. In the case of bryophytes normally the whole plant is used for chemical studies. If possible, fresh plant material should be extracted, especially for the analysis of certain terpenoids. Yet it is often impracticable to keep the plants fresh so that one has to work with dried plants. These should be air-dried at room temperature in a dark room for at least several days; drying plants in an oven at 80-100°C may cause decomposition of heat-labile compounds.

Whenever possible comparisons should be made of the compound pattern between fresh and air-dried plants. Cultivation of the species under chemical investigation is desirable, but it is still very difficult to grow many bryophytes under natural conditions. Once cultivated plants have changed morphologically, which is often the case under laboratory or greenhouse conditions, their compound pattern may change too so that results on chemical constituents from "greenhouse plants" are not comparable with results from plants from natural habitats.

A compound or a compound pattern is only acceptable as a chemotaxonomic marker when it is qualitatively, and possibly quantitatively, stable. This means its occurrence in the plant should not depend on seasonal, ecological, geographical or other environmental conditions. To determine stability it is necessary *to check as many samples as possible* from a wide range of environments.

When using herbarium specimens, the age of a collection has to be taken into account. The compound pattern of old herbarium specimens should be compared with that of recently-collected plants: suitable compounds should be stable for at least a couple of years. In the case of flavonoids 100-year old herbarium specimens of *Radula complanata* still showed the same pattern as freshly collected plants (Mues,1984). Furthermore, it is important to know and record the condition of the material used, i.e. whether it was purely gametophytic, or mixed gametophytic and sporophytic, or sporophytic alone. Some bryophytes exhibit changes in compound patterns when entering into the reproductive phase, e.g. *Marcantia berteroana* (Markham et al., 1978). Since nothing is known as yet about chemical differences between gametophyte and sporophyte, ideally both generations should be investigated separately.

3. Chemical Races

As mentioned above, several samples, representative of the geographical range of a species, should be checked for stability of the compound pattern under investigation. There are already several reports of bryophyte species with different chemical constituents being indistinguishable, or not clearly distinguishable, by other characters. They occur as distinct chemical races, and taxonomists should be encouraged to look for other characters which may have been overlooked previously. *Conocephalum conicum*, for example, is known to be variable in its flavonoid pattern (Markham et al, 1976b; Porter, 1981) and populations from Poland, other parts of Europe and North America have been shown to be polymorphic in 4 enzyme systems; in this case it was possible to distinguish between larger and smaller forms of the species (Szweykowski et al., 1981a; Szweykowski, 1984). Other chemically polymorphic species are *Scapania undulata* (Huneck et al., 1983), *Porella platyphylla* (Mues, 1982b), and *Radula lindenbergiana* (Mues, 1984).

Chemical races may only be detected for one compound class, e.g. only for terpenoids or for flavonoids. In these cases the less variable compound class is the more useful for taxonomic purposes. The detection of chemical races is only possible after analysis of many different samples, so the help of taxonomists with the collection of material is very necessary. For the comparison of compound patterns often only 100 mg — 1 g of air-dried material is sufficient. Results obtained from only one collection of a species are of very limited chemotaxonomic relevance.

4. Biosynthesis of Compounds

A compound detected in a plant represents the end product of a complicated biosynthetic pathway. For a number of cormophytes, the pathways for the main classes of secondary plant products are well known, but bryophytes are, so far, only poorly investigated in this respect. Thus it is possible that the biosynthesis of these compounds might differ between bryophytes and cormophytes. Although theoretically it is highly improbable that such highly-complex pathways evolved polyphyletically, full investigation is required before any firm conclusions can be reached about phyletic links between mosses, liverworts, hornworts, pteridophytes, spermatophytes, and green algae.

When the foregoing problems are taken into account and phytochemists co-operate closely with taxonomists and specialists in other fields, a variety of useful characters may emerge which will permit more satisfactory treatment of critical taxa. In my view there should exist at least several unrelated, stable characters which clearly define one taxon from another before it should be given specific rank. I strongly support the notion that two taxa which differ in only one character, be it chromosome number, sexuality or chemical, should not be regarded as distinct species. In this context Hawksworth (1976) states that the concept of "chemical species" in lichens is presently highly controversial. Lichenologists are now searching for additional chatacters before treating such cases as species, otherwise an infraspecific rank is preferred.

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IAB

CONSTITUTION BALLOT

THE RESULTS of the postal ballot were as follows:-

59 votes received

50 in favour of all proposals

Hence all proposals accepted (2/3 majority required).

A copy of the revised Constitution will be published, in due course, in these columns.

S.R. Gradstein, Secretary, IAB. 15.v.1985.

BRYOLOGICAL DRAWINGS OF GEORG ROTH (1842-1915) AT MICH

DR. HOWARD CRUM of Ann Arbor, Michigan, informs us that 969 plates of unpublished drawings by Georg Roth, as well as the manuscript for the Orthotrichaceae and the Calymperaceae, originally for publication in Die aussereuropäischen Laubmoose (TL-2/9643)*, are on permanent loan at the University of Michigan Herbarium (MICH). In addition, there is "what appears to be the manuscript (but not the drawings) for Die europäischen Laubmoose" (TL-2/9641, published completely). The drawings are available on loan from MICH. The number of species illustrated (12 on each plate) will be over 10,000.

These drawings are important because Roth had access to the Berlin herbarium and to the many types of Karl Müller hal. which were destroyed, together with the major part of the Berlin collections, in 1943. We could, alas, not enter this information into TL-2, but the statement that the plates for the unpublished volume of the Aussereur. Laubm. were at MICH in January 1981 was correct and can now be amended in the sense that the drawings and manuscript are at MICH permanently.

F.A. Stafleu, Tweede Transitorium, Heidelberglaan 2, 3584, CS Utrecht, The Netherlands.

[* TL-2 = Taxonomic literature, Ed. 2. Vol. 4 (P-Sak) by F.A. Stafleu & R.S. Cowan (1983). Regnum vegetabile, 110, 1214 pp.

9643 = Number of title on p.922.

Editor]

FIELD MEETING IN NEW ZEALAND

THE THIRD in a series of annual bryological field meetings will be held 31 January - 3 February, 1986 at the University of Canterbury Field Station at Cass, New Zealand. Field trips will be made to montane, subalpine and alpine localities in Arthurs Pass National Park and will be organized by Allan Fife and Bryony Macmillan of Botany Division, DSIR. Registration will be limited to ca. 25 participants. Overseas bryologists who might be visiting New Zealand at this time would be most welcome.

Details of the weekend have yet to be finalised. For further information write to Mrs. Philippa Horn, Plant Sciences Department, Lincoln College, Canterbury, New Zealand.

Chromosome banding [contd. from page 1]

sophisticated staining worthwhile, but this is not true. Cytological preparations of the clarity demonstrated photographically in a number of research papers (e.g. Segawa, 1965; Ono, 1970; Inoue, 1971; Berrie, 1974; Inoue & Yamashita, 1980 and McAdam, 1982) are indisputable evidence that the high standards of preparation required for banding have been attained repeatedly. Successful banding should therefore follow as a matter of course.

Of the many banding techniques now available, G-banding has recently been achieved in *Pinus resinosa* (Drewry 1982) but has met with very little success elsewhere in the plant kingdom, whereas R-bands, the reverse of G-bands, have not been demonstrated in plants at all. None of the newly-developed counterstaining fluorochrome techniques (Schweizer, 1981) has yet been applied to bryophyte chromosomes but all the banding techniques outlined below are known to be relevant to this group of plants.

C-banding. Discovered as early as 1970 (Parude & Gall, 1970), C-banding involves three steps in the treatment of high-quality squash preparations, which have been air-dried at room temperature following the removal of the coverslips by a rapid freezing technique. According to Holmquist (1979), their chemical effects are (i) differential depurination by acid treatment; (ii) DNA denaturation in barium or sodium hydroxide and (iii) chain breakage in a salt solution. Subsequent staining with buffered Giemsa, a proprietory mixture of stains, results in deeply-coloured bands or blocks of constitutive heterochromatin. That is to say, it identifies regions of chromatin in which the DNA is highly repetitive, containing sequences of purines and pyrimidines that are not, in general, coding sequences. In species of *Pellia*, the C-bands coincide very closely with the classic heterochromatin for which Heitz (1928) coined the word. C-banding has, moreover, been shown to be widely applicable to mosses and liverworts (Newton, 1977a, b, 1979, 1981, 1983a, b, 1984) and technical details are available in Newton (1977a, b, 1985b).

N-banding. Incubation of squash preparations in hot trichloroacetic acid (Matsui & Sasaki, 1973) or hot sodium dihydrogen orthophosphate (Funaki et al., 1975) followed by Giemsa staining results in N-banding. The treatment is considered by some authors (e.g. Hägele, 1977) to be specific for certain residual non-histone porteins which, depending on the organism, may remain in some or all of the C-banding heterochromatin or at genetically-active sites. Gerlach (1977), however, has implicated DNA with polypyrimidine tracts in N-banding. Although few bryophytes have so far been subjected to N-banding, those few have produced clear and useful cytological markers for comparative purposes (Newton, 1985 b). Unlike C-banding, it is also an extremely rapid process (Newton, 1985a).

Q-banding. A number of quinacrine derivatives have been found to produce differential fluorescence along the length of chromosomes following excitation at an appropriate wavelength. The fact was discovered by Caspersson et al. (1968, 1969) using quinacrine mustard but only quinacrine dihydrochloride, which gives similar results (Caspersson et al., 1969), has been applied to bryophytes (Newton, 1985b). While the resulting banding patterns are clear and specific in bryophyte metaphase chromosomes, and are therefore highly efficient cytological markers, their interpretations is not as yet completely straightforward. There are two main reasons for this. Perhaps the more important is related to the fact that these fluorochromes, although bound more or less uniformly to DNA, are considered to fluoresce preferentially in regions enriched in adenine-thymine, AT, base pairs (Van de Sande et al., 1977). In general, such regions show bright Q-bands, whereas regions with DNA of high guanine-cytosine, GC, content show quenched fluroescence, but known exceptions indicate that other factors are also involved (cf. Sumner, 1981, 1982). In addition it should be emphasized that Q-bands, as displayed by bryophyte and other plant chromosomes, are constant bands and are therefore not directly analogous with the fluctuant Q-bands of animal chromosomes. The latter are generally found to correspond to G-bands (Hsu, 1973). Nevertheless, the technique of Q-banding is invaluable, particularly in that it can be used as the first of a sequential staining procedure. After Q-banding, the slides can be rinsed prior to further treatment to produce either C-bands or N-bands in the same material. Exact location of the three relative to each other is therefore possible and has already provided useful information about the structure and behaviour of *Pellia* chromosomes (Newton, 1985 b).

Hoechst 33258-banding. Employing the same principle of fluorescence as Q-banding, but using a different excitation wavelength, Hoechst 33258 (Hilwig & Gropp, 1972) offers a more reliable means of identifying AT-enriched sites (Müller & Gautier, 1975). When applied to *Pellia epiphylla*, the Hoechst fluorochrome produces results that are indistinguishable from those obtained by Q-banding (Newton, 1985b). In *P. neesiana*, however, it has proved capable of identifying differential AT-enrichment that Q-banding fails to locate. Full details of the technique found suitable for liverworts are given elsewhere (Newton, 1985b) and, like Q-banding, Hoechst 33258 staining can be followed by either C- or N-banding in the same material.

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Desiderata

I WOULD BE GRATEFUL to receive samples of very young and older capsules of *Fontinalis antipyretica* (or other *Fontinalis* species) for study of sporogenesis by TEM.

Anne Seé, Laboratoire de Cryptogamie, 12 rue Buffon, 75005, Paris, France.

Wanted: living European *Tortella* species

I HAVE STARTED WORK on a "Taxonomical investigation of European *Tortella* species" as a thesis for a doctoral degree. Samples of *Tortella* species from different European countries are needed for cultivation for cytological, chemotaxonomical and eco-physiological investigations.

The following species are of special interest.

Tortella densa	*Tortella rigens*
T. fragilis	*T. nitida*
T. humilis	*T. flavovirens*
T. inclinata forms + varieties only	
T. tortuosa forms + varieties only	

To anyone willing to help me I can offer in return to help with the determination of critical and difficult Tortellas of Europe.

Please write to: Rudolph May, University Duisburg, Fachbereich 6:Botanik,Lotharstr. 1, 4100, Duisburg, West Germany.

Seventh All India Botanical Conference

JAIPUR

28-30 DECEMBER, 1984.

IN THE PAPER READING SESSIONS, nine papers were presented on bryophytes, five from Lucknow University and one each from Kumaon University (Nainital), Rajasthan University (Jaipur), the Botanical Survey of India (Allahabad) and the National Botanical Research Institute (Lucknow).

The titles and authors of the papers were as follows:-

1. *Acrolejeunea sikkimensis* (Mizut.) Gradst. in Kerala. U.S. Awasthi.
2. On two species of *Cololejeunea* (*Pedinolejeunea*) new to the Indian bryoflora. G. Srivastava.
3. Remarkable capsule wall morphology in *Porella chinensis* (St.) Hatt. F. Shaheen.
4. On *Phaeoceros laevis* (L.) Prosk. in India. A.K. Asthana.
5. The genus *Anomalolejeunea* (Spruce) Schiffn. in India. A. Jain.
6. An interesting genus *Tritomaria* Schiffn. in India. G.B. Pant & S.D. Tiwari.
7. Biochemical studies on some species of *Plagiochasma* L. et. L. P.D. Sharma & S.K. Sen.
8. *Hymenostyliella llanosii* (Broth.) H. Robinson (Pottiaceae), a tufa-forming moss from Madhya Pradesh, and its association with algae. J. Lal.
9. Studies on the genus *Frullania* Raddi from the Andaman Islands. V. Nath.

J. Lal, Botanical Survey of India, 10 Chatham Lines, Allahabad-211002, India.

I WISH TO RECEIVE living or revivable material of the following genera of Marchantiales for work on their chromosomes.

Athalamia spp.	*Monoselinium*
Aitchinsonielle	*Neohutchinsonia*
Buccegia	*Peltolepis*
Cornisia	*Sauteria*
Cryptomitrium	*Stephensoniella*
Cyathodium	*Wiesnerella*

I would be grateful to receive any samples of these plants.

Prof. Dr. O.H. Volk, Botanisches Institut, 35 Mittlerer Dallenbergweg, D-8700 Würzburg, West Germany.

Congratulations and Thanks to Dr. Sinske Hattori

By Hiroshi Inoue

AUGUST 10th is the 70th birthday of Dr. Sinske Hattori, well-known, eminent Japanese hepaticologist, and the Director of the Hattori Botanical Laboratory.

Praha, 1982,
(Courtesy of M. Andre Causse)

Until 1940, bryology in Japan was sustained by a small but dedicated group of professionals and amateurs. Dr. Hattori is almost entirely responsible for changing the scope and direction of those early studies and for promoting them to their present internationally-recognized level. He graduated from the University of Tokyo (formerly Tokyo Imperial University) in 1940 with the thesis for B.Sc. which was published in 1944 as "Contributio ad floram hepaticarum Austro-Kiusiuensem" by the National Science Museum, Tokyo. In 1941, he got a position at the National Science Museum, Tokyo (formerly Tokyo Science Museum) as Assistant Curator of Botany, and he held this position until 1945 when he went back to Nichinan, Miyazaki Pref., his home town. At Nichinan he started immediately his preparations to establish his own private laboratory, which was named the Hattori Botanical Laboratory. It was officially recognized by the Japanese Government on March 1st, 1946, and he became its Director. In 1948 he was awarded the degree of D.Sc. from Tokyo University for his thesis "Contributio ad floram Hepaticarum Yakusimensem" which appeared in the Journ. Hattori Bot. Lab., No. 1-6 (1947-1952).

Although Dr. Hattori has never had a position at a University, he has helped so many young students in Japan. In the early days of the laboratory he took two young students as staff members: they were Dr. Z. Iwatsuki (in 1954) and Dr. M. Mizutani (in 1956). Furthermore, he encouraged and guided in the direction of bryology many young students, among whom were Dr. N. Kitagawa (hepatics), Dr. K. Yamada (hepatics), Dr. T. Amakawa (hepatics) and the author.

Numerous bryological contributions made by Dr. Hattori are well known and highly valued, and further remarks about this aspect of Dr. Hattori's achievements are certainly unnecessary. Recently, he has become a specialist of the troublesome genus *Frullania*, producing numerous contributions, and treating the species from almost the whole world. He is a very busy person with much business about his laboratory or his companies, but still he is examining *Frullania* specimens, typing manuscipts, letters, etc. His most time-consuming business is editing the Journal of the Hattori Botanical Laboratory, as he checks all manuscripts throughout by himself and makes many claims on them.

For his activities in bryological science, several honourable prizes have been awarded to him. Among these are the Cultural Prize of Miyazaki (in 1952), the Purple Ribbon Medal (in 1970), and the Asahi Cultural Award (in 1976).

In spite of all these activities, Dr. Hattori is quite human! His personality is very warm and generous, and he is always thinking about the situation of other persons. He is very thin, but still he has enormous vitality! He also has great talent for entertaining! With 2-3 glasses of beer (but, formerly Japanese sake!) his spirit relaxes and he enjoys singing folk songs of Miyazaki, entertaining others with his beautiful voice.

In Japan, the age of 70 is said to be "Koki" which traditionally means "very uncommon age". Someone said in Japan that "Koki" age is still young, like a little boy. So I hope Dr. Hattori still has a lot more "power" to shake up the field of bryology in the future.

Congratulations for his "Koki"!

Division of Cryptogams, National Science Museum, Ueno Park, Daito-ku, Tokyo, Japan.

Recent Publications

Australasian Bryol. Newsletter, No. 12, 1-9, 1985.

Evansia, 1(2) Dec. 1984; 2(1): 1-16, May 1985.

Taxon, 34(2): 191-392, 1985.

Sayre, G. 1984. Index to the moss herbarium of William Starling Sullivant (1803-1873). Cambridge, Mass., Farlow Herbarium, Harvard University, Unbound, 117 sheets of typescript (8½ x 11 ins.). Price U.S. $ 5.00, plus 0.50 postage U.S., or $ 1.00 elsewhere. Available from the Farlow Herbarium, 20 Divinity Avenue, Cambridge, MA 02138, U.S.A.

The herbarium consists of two parts: a "main" part of some 10,800 specimens and another of more than 4,000 in special collections not incorporated. Additionally there are over 4,000 specimens in exsiccata sets not issued by Sullivant, and an undisclosed number of hepatics. While strong in American material, there is also a large "foreign" component, as Sullivant regularly exchanged material with the leading bryologists of his day. In 1980-82 the herbarium was completely remounted and the nomenclature standardized "into a state consistent among its parts and with Sullivant's publications".

The index is to the "main" part of the moss herbarium. It consists of a list of genera, with sheet numbers, followed by an alphabetical list of specific and infra specific epithets, each preceeded by a sheet number(s) and the number of specimens, and followed by the name of its genus. As many of Sullivant's bibliographic types are in the separate collections, they will not be found in the index.

The whole is clearly presented and easy to consult, but the use of a cheap, spiral or velo binding would have been helpful, particularly as none of the pages bear a running title or other identificatory mark.

Stafleu, F.A. & R.S. Cowan, 1985. Taxonomic literature. A selective guide to botanical publications and collections with dates, commentaries and types. Vol. V: Sal-Ste. Ed. 2. Regnum vegetabile, Vol. 112: 1-1066. Utrecht/Antwerpen, Bohn, Scheltema & Holkema; dr.W. Junk, b.v., Publishers, The Hague/Boston.

[Vol. 1: A-G, Regnum vegetabile, 94: 1-1136, 1976; Vol. II: H-Le, Ibid, 98: 1-991, 1979; Vol. III: Lh-O, Ibid, 105: 1-980, 1981; Vol. IV: P-Sak, Ibid, 110: 1-1214, 1983.

Vol. VI is due before end of 1986;
Vol. VII (to end of Z) before end of 1987; and
Vol. 8 (consolidated indices), which will complete the work, in 1988.]

This volume continues "TL-2", one of the most important taxonomic referals currently in publication. A review of an earlier volume in these columns (Bryol. Times, 10:10), outlined the arrangement and scope of the work and drew attention to the fact that Edition 2 contains much more of interest to the bryologist than its predecessor.

In the present volume information will be found on works by such well-known bryologists as: C.M. van der Sande-Lacoste; C.G. Sanio; F.W. Sauerbeck; L.I. Savicz-Ljubitzkaja; V.F. Schniffner; W.P. Schimper; C.F. Schwägrichen; J.A. Scopoli; O. Sendtner; W.R. Sherrin; T.R. Sim; J.E. Smith; H.M.C.L.F. zu Solms-Laubach; R. Spruce and F. Stephani.

NEW IAB PUBLICATION

Vitt, D.H., Gradstein, S.R. & Z. Iwatsuki. 1985.

Compendium of Bryology

A world listing of herbaria, collectors, bryologists and current research. Bryophytorum bibliotheca, Bd. 30: 1-355. Price DM 60.- Available from J. Cramer Verlag, In den Springaeckern 2, D-3300 Braunschweig, West Germany.

This compendium presents an up-to-date world listing of the bryological contents of 471 herbaria. It lists the location of the collections of some 2,200 bryophyte collectors, and gives an alphabetical listing of 535 current researchers in bryology. The current research of these bryologists is presented under 30 research categories.

Addresses are included for all IAB members as well as indices to herbaria by acronyms, and researchers by countries.

Special offer to IAB members

Members of IAB in good standing are each entitled to one copy at a discount of 75%, i.e. at a price of DM 15.-. To obtain this discount, orders must be on the IAB order from dated March 1985. (Distributed with Bryol. Times No. 31. If any member did not receive a copy they should contact Dr. S. R. Gradstein in Utrecht).

Payment by personal cheque or postal money order to J. Cramer Verlag as follows:-

U.S. residents, U.S. $5.00;
U.K. residents, £4.30;
Residents of all other countries, DM.15.

Orders at the special offer price will only be accepted on the special order form, accompanied by payment.

Letters to the Editor

Dear Sir,

The Mixed Collection "Heresy"

The arguments (Wyatt et al., 1985) over the use of mixed collections in bryophyte taxonomy would appear to be no more than a (much delayed) re-run of the rise of the New Systematics and experimental taxonomy a few decades ago. Virtually all the arguments considered then must be equally valid now, and I question the value of a re-run of battles fought long ago.

Our problem is that, in general, we cannot culture our plants well enough for wholly natural morphology and reproduction to be achieved, and we are forced to use herbarium material on the majority of occasions. We must all know that our zoological colleagues lay great weight on breeding relationships within experimentally-amenable groups, but on a world scale most zoological taxonomic studies still utilise the broad fields of comparative morphology and anatomy. And so, of course, do most botanists. In real life it is simply not constructive for specialists with access to phytotrons, etc., to issue a diktat that everyone else's work is useless; the practical necessity is that we adjust our taxonomy progressively in the light of further and improved knowledge, but we do not throw away the accumulated knowledge of our 'ignorant' predecessors.

This is not in any way to denigrate the value of experimental phenotypic and genotypic studies *when they are feasible*. Indeed, without them, the demonstration of specific distinction is probably impossible - but - let us keep a sense of proportion. Surely the answer is to encourage the use of experimental techniques when appropriate and to emphasise their value, but to accept that by default a great deal can still be achieved through the comparative study of herbarium samples, (mixed or otherwise).

Reference

Wyatt, R. Lane, D.M. & A.Stoneburner. 1985. The "Mixed Collection Heresy" a review and update. Bryol. Times, 31: 3.

D.H. Dalby, Department of Pure and Applied Biology, Imperial College, London SW7 2BB.

Dear Sir,

The "Mixed Collection Method" AGAIN

Three colleagues have recently criticized the practice of using mixed stands for taxonomic purposes (J. Hattori Bot. Lab., 49: 237-239, 1981; Taxon 31: 698-704, 1982). From the review in The Bryological Times, 31:3,1985, it seems that these authors are surprised that no rebuttal has been presented in print. I confess, there is, indeed, one point that may deserve a comment.

I have been flattered by the wide publicity this simple and cheap method has received through the papers cited above and about its occasional ascription as the "mixed collection method of Isoviita". Alas, the attribution to me is, of course, misleading.

Nobody knows who was the first person, or the first taxonomist, to sort out individuals of "closely-related plants" (a completely subjective concept) in mixed populations seen in the field (or in herbarium packets) and use their morphological differences as distinctive characters. The "method", basically a matter of self-evidence, was born long ago and was later found particularly useful by keen observers such as some promoters of Nordic phytosociology.

Among bryologists, two early users of the method in the late 1800s and early 1900s were H. Lindberg and H. Buch respectively. That I, along with a few colleagues, felt it necessary to discuss the matter in some detail in our papers was largely because very few colleagues abroad seemed to be aware of it.

If the name of a bryolcgist should be associated with this "heresy", I should suggest its attribution to R. Tuomikoski, now well-known for his critical and successful use of the method in his studies performed nearly half a hundred years ago. Actually, even this historical fact is clear in the Taxon paper referred to above. So what...!

Pekka Isoviita, Botanical Museum, University of Helsinki, Unioninkatu 44, SF-00170, Helsinki, Finland.

Deaths

CRAMER, Jörg, Cryptogamic publisher, at Braunschweig, on 4 June 1985; born 1 Dec. 1931.

DIARY

For explanation of acronyms, see Bryol. Times, 31: 7-8, 1985.

Aug. 2-4. BLAM. Harz Mountains. Leader: W. Heimhold. Further information from W. Heimhold, Rottenweg 4, 3394 Langelsheim 1, B.R.D.

Aug. 5-10. IAB. Budapest and Vácrátót. Conference on Bryoecology. For 3rd circular, see Bryol. Times, 30:9.

Aug. 7-11. SBLS. Field work in Engelberg (northern Alps) in relation to mapping programme. Further information from: Dr. K.A. Ammann, Syst.-Geobot. Institut, Altenbergrain 21, CH-3013, Bern, Switzerland.

Aug. 10-14. ABLS., Gainsville, Florida. For details see Bryol. Times, 30:3. Further information from: Dr. Norton G. Miller, New York State Museum Science Service, State Education Department, Cultural Education Center, Albany, New York 12230, U.S.A.

Aug. 12-14. CEBWG. Eger, Hungary. 4th Biennial Meeting. For 3rd circular, see Bryol. Times, 32:7.

Sept. 7-8. SBLS. Romont (Canton Fribourg, limit plateau prealps). Bryophyte mapping weekend. Further information from Dr. K.Ammann, Syst.-Geo-bot. Institut, Altenbergrain 21,CH-3013 Bern,Switzerland.

Sept. 16-21. Edinburgh, Scotland. 2nd Symposium on plant life in SW Asia. For preliminary details of bryological programme,see Bryol.Times, 27:8.

Sept. 21-22. BBS. Paper-reading Meeting and AGM. National Museum of Wales, Cardiff. Local Sec.: Mr. A.R. Perry, Department of Botany, Cardiff 3NP. Full details in Bull.BBS,46.

Sept. 20-22. 4th Midwestern bryological Foray, Cusino Lake Field Station of Northern Michigan University. Professionals, students and amateurs are cordially invited to participate. Further information from Dr. Maynard Bowers, Department of Biology, Northern Michigan University, Marquette, Michigan 49855,USA.

Sept. 20-22. Tenth Annual LeRoy Andrews Foray. Craftsbury Center,northern Vermont. Further details from Nancy Slack, Russel Sage College, Troy, New York, U.S.A.

Oct. 4-6. First Blomquist bryological Foray, Roan Mtn. State Park, Tennessee. For details see Bryol. Times, 31:6.

Oct. 31 - 3 Nov. WGMBE. Mont-Rigi. 3rd Meeting of lectures and field work in Hautes Fagnes region and in the Eifel. Further particulars from: Prof. Dr. R. Schumacker, Directeur, University of Liège, Station Scientifique des Hautes Fagnes, B-4898 Mont-Rigi, Robertville, Belgium, see Bryol. Times 32:4

Nov. 2-3. BBS. Taxonomic Workshop, Gilbert White Museum, Selborne, Hants. Local Sec.: Dr. J.E. Chatfield, The Gilbert White Museum, The Wakes, Selborne, Alton, Hants GU34 3JH. For details, see Bull. BBS, 45:17.

1986

Jan. 31 - 3 Feb. Cass, New Zealand. 3rd Annual bryological field meeting. See this issue, p. 3.

April 2-9. BBS. East Dereham, Norfolk. Spring field meeting. Local Sec.: Mr. R. Stevenson, 111 Wootton Road, King's Lynn, PE30 4DJ. Preliminary details in Bull.BBS, 46.

July 23 - 5 Aug. BBS. West of Scotland. Summer field meeting. 1st week, Fort William; 2nd week, Gairlock, Wester Ross. Local Secs.: Mr.G.P. Rothero (for Fort William) Benmore Centre, by Dunoon, Argyll, Scotland and Mr.D.G. Long (for Gairlock), Royal Botanic Garden, Edinburgh EH3 5LR. Preliminary details in Bull. BBS, 46.

Sept. BBS. Paper-reading meeting and AGM. University of Leeds. Local Sec.: Prof.D.J. Cove, Dept. of Genetics, University of Leeds, LS2 9JT.

Nov. BBS. Workshop. University of Reading. Preliminary details in Bull. BBS, 46.

1987

April 6-13. BBS. Penzance,Cornwall. Spring field meeting. Local Sec.: Mrs. J.A. Paton, Fair Rising, Wagg Lane, Probus, Truro, Cornwall,TR2 4JU. Preliminary details in Bull. BBS, 46.

July BBS. West of Ireland. Summer field meeting. 1st week Achill I.; 2nd week Wesport. Local Sec.: Dr. D.M. Synnott, National Botanic Gardens, Glasnevin, Dublin 9, Ireland. Preliminary details in Bull. BBS, 46.

July 24 - 1 Aug. XIVth IBC Berlin (West). Preceded by IAPT Nomenclature Sessions, July 20-24. For preliminary notice see Bryol. Times, 23: 9. Congress Address: XIV IBC. Bot. Garden & Museum, Königen-Luise-Strasse 6 - 8 , D-1000, Berlin (West) 33, Germany.

July - August. IAB. Mainz. Bryological Methods Workshop. For further information see Bryol.Times, 26:6.

THE INTERNATIONAL ASSOCIATION OF BRYOLOGISTS publishes The Bryological Times every two months, and the Advances in Bryology every two years. Material for The Bryological Times can be sent at any time, but submission dates for the Advances should be discussed with its Editor, Dr. Norton G.Miller (Albany) U.S.A. The Editors do not accept responsibility for the views of authors.

For details regarding membership of the International Association of Bryologists (currently U.S. $ 8.00 p.a.), write to the Honorary Secretary,Dr.S.R. Gradstein, Instituut voor Systematische Plantkunde, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands.

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ITEMS FOR THE NEXT ISSUE to be with the Editor, Dr.S.W. Greene, Department of Botany, The University of Reading, London Road, Reading RG1 5AQ, Berkshire, England (Telex 847813 RULIB) by 1st Sept. at the latest. Items for the regular columns should be sent direct to the column editors, whose names and addresses will be found in Bryol. Times, 31:9, 1985.