primarily with nomenclatural stability. The thrust of this article is on *confusion* in the application of names. For a name to have to change is troublesome and tends to bring nomenclature into disrepute. But even a change as serious as calling common soft wheat *Triticum hybernum* instead of *T. aestivum* can eventually be accommodated. The system of synonymy handles this well, whether in taxonomy itself, or in literature retrieval etc. Confused names, coming under the provision of Article 69, are quite different. There is no way that the general user of botanical literature can be made aware of the usage to which the name applies. Generally, he will not even be aware that there is more than one usage. Even for sophisticated taxonomists who understand what something like "*Solanum sodomeum* auctt. plur. non L." means, there would still be the problem of knowing whether a later author was using *S. sodomeum* L. in its correct sense (=*S. indicum* auctt. non L.) or in the traditional sense, for which there may not be a legitimate name (cf. Hepper, 1978; Brummitt, 1983a). Our literature retrieval and synonymy systems have really no way to cope with this situation. I believe, therefore, that the Code's traditional use in this situation of the words "*must* be rejected", which goes back to Article 64 of the Cambridge Rules (Briquet, 1935), is essential for unambiguous communication in botany.

The role of nomenclatural review committees is not threatened by this change. They must judge whether or not the name has been "widely and persistently used for a taxon or taxa not including its type". If the Committee judges that this is the case, the name is then rejected. Proposal 330 is designed to restore the *requirement,* that was in the Code for 50 years, to reject a name whose correct use is judged to be confusing.

(330) Proposal to alter the first line of Art. 69.1 to read:

"A name must be ruled as rejected if it is judged to have been widely and persistently . . . ".

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Proposed by: J. McNeill, Department of Biology, University of Ottawa, Ottawa K1N 6N5, Canada.

(331)-(334) Proposals to standardize the nomenclature in flagellate groups currently treated by both the Botanical and Zoological Codes of Nomenclature.

Certain groups of protists are claimed as plants (algae—protophyta) by botanists and as animals (protozoa) by zoologists. This is not just to be regarded as an amusing anachronism, for it is a cause of problems for practising taxonomists. The groups concerned can be loosely termed "phytoflagellates", being those flagellates with at least some photosynthetic members, as opposed to "zooflagellates", which are wholly non-photosynthetic and are claimed only by zoologists. The flagellate groups concerned are the following:

Botanical class	Zoological order
Dinophyceae	Dinoflagellida
Cryptophyceae	Cryptomonadida
Raphidophyceae	Chloromonadida
the flagellated Xanthophyceae	Heterochlorida
Chrysophyceae	Chrysomonadida and Silicoflagellida
Prymnesiophyceae (=Haptophyceae)	Prymnesiomonadida (=Haptomonadida)
Eustigmatophyceae	Eustigmatida

Euglenophyceae	Euglenida
Prasinophyceae	Prasinomonadida
the flagellated Chlorophyceae	Volvocida
Craspedophyceae	Choanoflagellida (often grouped with the Zooflagellates)

Indicative of this duplication is the appearance of these groups twice in the recently published *Synopsis and Classification of the Living Organisms,* although their treatment in the Kingdom Animalia (by J. O. Corliss *in* Parker, 1982) is admittedly redundant and cursory. It should be stressed that, in two instances (the Xanthophyceae and Chlorophyceae), the zoologists claim only the flagellated members of natural groups also containing coccoid, filamentous and thalloid forms.

One might assume that the dual taxonomic treatment of the organisms in question simply leads to redundant classifications which can be readily ignored by those of the opposite persuasion. This is not the case; there are some nomenclatural problems arising from the application of the current Codes of Nomenclature (International Code of Botanical Nomenclature, hereinafter ICBN, Voss et al., 1983; International Code of Zoological Nomenclature, hereinafter ICZN, 3rd. Edition, Ride et al., 1985) which are far from trivial. They can lead to the absurd situation in which a scientist considering him/herself a zoologist may find him/herself to be precluded from using names that a botanist can use, and *vice versa.* These problems have been noted previously (Loeblich and Tappan, 1966; Sournia et al., 1975; Taylor, 1976) but no steps have been taken to rectify the situation formally. We hope that our proposals will provide a practical solution to the problem.

At the beginning of both the Botanical and Zoological Codes there are statements declaring their independence of each other (ICBN Principle 1; ICZN Article 1). Although the Codes are similar in most respects, they differ not only in terminology, but also in some critical principles (conveniently summarised by Jeffrey, 1973 and Sournia et al., 1975). An obvious one is the requirement for Latin diagnoses for new taxa of plants. For living "algae", to which the present groups are conventionally assigned, this regulation applies only if they have been described after 1 January, 1958 (ICBN Art. 36.2); it does not apply to any fossils, whether of algae or of other plant groups. However, there are many others, including the use of "name groups" by zoologists but not botanists; the inapplicability of the ICZN to taxa above the rank of superfamily or below the rank of subspecies; the requirement for botanists, but not zoologists, to cite a basionym when making a new combination after 1952 (ICBN Art. 33); the unacceptability of tautonyms in the ICBN (Art. 23); and so on. Consequently, a name may be valid to a botanist yet not available to a zoologist, and *vice versa.*

An example is offered by the dinoflagellate genus *Phalacroma,* erected by Stein in 1883 within the Plant Kingdom. It is preoccupied by *Phalacroma* Howle & Corda, 1847, a trilobite genus. For this reason Balech (1944), a zoologist, created *Prodinophysis* for the dinoflagellate taxon. He was not followed by botanists in this. Subsequently, the issue was circumvented when *Phalacroma* Stein came to be treated as a variant of *Dinophysis* Ehrenberg. However, whilst the name *Phalacroma* remains available to botanists, it is not valid for zoologists.

Both Codes accept as available or validly published (the terminology differs in the two Codes) those taxa transferred to their kingdom, provided that they meet the requirements of the Code governing the kingdom in which they were originally described (for algae ICBN Art. 45.4; ICZN Art. 10f). However this does not solve all of the problems arising from overlap. For example, what is one to do when the original author did not indicate whether he was acting as a zoologist or a botanist when naming a taxon which could be "claimed" by either? Does one determine this from his previous publications, from the journal title, or from terminological clues? Perhaps he/she was unaware of the legalities involved? Can an author describe some taxa under the declared auspices of one Code and then describe other members of the same group of organisms under a second? Presumably so, since neither Code precludes such a procedure.

A major source of difficulty stems, ironically, from a similarity in the Codes. This is the acceptance of homonyms (identically spelled names) as valid outside the kingdom to which the Code in use applies (ICBN Art. 65; ICZN Art. 1c). If a generic name has been used previously for an organism considered to be an animal by its author, the identical name can be used for a new genus of plant. For example, the genus *Dinoceras,* proposed by O. C. Marsh, 1872, for a fossil mammal, was used also by Schiller sixty years later (1931) for a dinoflagellate. This procedure was perfectly valid under the Botanical Code; but, for zoologists, the name was preoccupied. Later, Schiller himself decided that his genus was synonymous with an earlier genus, *Dinophysis* Ehrenberg. Despite its author's change

of mind, *Dinoceras* Schiller, being validly published, remains a name available to botanists if the genus were subdivided—though not to zoologists.

The situation is exacerbated by the consideration for priority of names created at different ranks within the same name group—e.g. subgenus with genus—subfamily with family) by zoologists, but only within the same rank by botanists. For example, the generic name *Diplopsalis* was applied by Bergh (1881) to a dinoflagellate. Under the Botanical Code, this is a valid name; nor is it preoccupied by any generic name validly published under the Zoological Code. However, it *is* preoccupied by an avian subgenus, *Diplopsalis* Sclater; and, since this is within the same name-group, Bergh's genus is not valid under the Zoological Code (though used nevertheless by zoologists).

The fact that a tautonym—a binomen in which the specific name repeats the generic name—is legitimate under the Zoological Code but illegitimate under the Botanical Code creates additional problems. The name *Galea galea* Maier, 1959, was unquestionably published under the Zoological Code. Under that Code, the generic name was seven times preoccupied (by *Galea* Meuschen, 1787; *Galea* Cuvier, 1817; *Galea* Smith, 1817; *Galea* Meyer, 1833; *Galea* Meerch, 1852; *Galea* Quenstedt, 1874 and *Galea* Kristan, 1957: see Gerlach, 1961, p. 198). Since the generic name is not available under that Code, it cannot be legitimatized under the Botanical Code. Sarjeant (1964, p. 176) treated the species as an acritarch under the name *Baltisphaeridium galeum* [*sic*] (Maier) Sarjeant, 1964; Davey, Downie, Sarjeant and Williams (1969, p. 15) recognized it to be a dinoflagellate cyst and styled it *Areoligera galea* (Maier) Davey et al., 1969. More recently, one of us demonstrated that the species is a senior synonym of *Chiropteridium dispersum* Gocht, 1960; accordingly, the combination *Chiropteridium galea* (Maier, 1959) Sarjeant, 1983 was proposed. Lentin and Williams (1985, p. 140) stated that, as a tautonym, the name *Galea galea* was illegitimate under the Botanical Code and must be rejected in its entirety; they proposed that it be substituted by *Chiropteridium mespilanum* (Maier, 1959) Lentin and Williams, 1985. However, the position is less clear-cut than they infer. The specific name, at least, was valid under the Zoological Code at its time of publication. At the point of transfer to the Botanical Code—the time when it was first recognized definitely to be a dinoflagellate—it was placed with *Areoligera* and was thus no longer a tautonym! For botanists, it is an unresolved question whether the legitimate name is *C. galea* or *C. mespilana*: Article 45.4 of the ICBN implies that the former name is correct, but other interpretations are possible. This well exemplifies the problems arising from the simultaneous application of dissimilar sets of taxonomic rules to the same organism.

We believe that the time has come to resolve this confusion formally, so that a uniform taxonomy can be utilized for all phytoflagellate groups by both botanists and zoologists. Three possible solutions come to mind:

(i) There might be agreement that only one Code apply to the groups in question. At present, far more botanists work with these organisms than zoologists. Between 1971 and 1977, for example, approximately twice as many botanical papers than zoological papers were published relating to dinoflagellate taxonomy, whereas between 1930 and 1970, there was a slight preponderance of zoological over botanical papers (see references cited by Sournia, 1973, 1978; Sournia, Cachon and Cachon, 1975). This could be used to argue for their exclusive treatment by the Botanical Code. However, some of the groups are predominantly non-photosynthetic. For example, the choanoflagellates include only one reportedly photosynthetic species, *Stylochromonas minuta* Lackey; this species has not been again recorded since its first description. Even if a few others are reported and confirmed, a strong case could be made for that group to remain in the Animal Kingdom. Similarly, several phytoflagellate groups are overwhelmingly photosynthetic and might reasonably be considered simply as plants. These are the chloromonads (raphidophytes), xanthomonads, prymnesiomonads, eustigmatophytes, silicoflagellates, prasinomonads and volvocalean chlorophyceans. Their powers of movement furnish only an extremely superficial reason for their inclusion in the Animal Kingdom. If one were to select an arbitrary percentage of 90% (or even 95%) or more photosynthetic or non-photosynthetic species in order to determine treatment by one Code or the other, the chrysomonads and cryptomonads would likewise fall exclusively within the purview of the Botanical Code.

The remaining groups, the dinoflagellates and euglenoids, constitute the heart of the problem, for these have substantial proportions of both photosynthetic and non-photosynthetic members (roughly 50:50 in the former and 75:25 in the latter).

(ii) A second alternative is the creation of a new Code to deal with members of the Kingdom Protoctista (or Protista), in which case the phytoflagellate nomenclatural problems would fall away.

There is a strong movement at present to revive old proposals for a separate kingdom(s) for the "Lower Eukaryotes" (e.g. Margulis and Schwarz, 1982), but this is hampered partly by differences concerning the criteria used to delimit that kingdom and partly by the conservatism of workers dealing with its potential members. It seems unlikely that these problems will be resolved in the near future; widespread acceptance and the creation of a new Code are much further away.

(iii) The third alternative is a standardization of the Botanical and Zoological Codes so that phytoflagellates are treated identically under both. This is the alternative that we favour. We propose that both Codes be modified, as follows:

1. Latin diagnoses be recommended, but not obligatory, for modern taxa of phytoflagellates only;
2. Priority considerations be restricted exclusively to names within the same rank of genus or above, not applying the name-group principle;
3. Homonymy be not permitted if the name has been previously used at the same rank in either code;
4. Tautonyms be treated as acceptable under both Codes.

We note that the *International Code of Nomenclature of Bacteria* (Lepage et al., 1975) does not permit homonymy if a name has been previously used for bacteria, fungi, algae, protozoa or viruses [ICBN Art. 65, Note 1: see also Lepage et al., 1975]. Furthermore, the Botanical Code already has articles dealing with particular groups of plants, e.g. Art. 59 for pleomorphic fungi.

The groups to be covered by the changes in the Codes would be most of those listed as "phytoflagellates" at the beginning of this paper. The making of a distinction between the flagellated Chlorophyceae and Xanthophyceae and the other members of those algal classes, seems to be inappropriate [the phytoflagellates are here defined, for nomenclatural purposes only, as comprising the Dinophyceae, Cryptophyceae, Raphidophyceae, Chrysophyceae, Prymnesiophyceae (=Haptophyceae), Eustigmatophyceae, Euglenophyceae, Prasinophyceae and Craspedophyceae] and unworkable from a nomenclatural standpoint. Consequently we feel that these two groups should be covered exclusively by the ICBN and, for the purposes of the Codes only, excluded from the "phytoflagellates".

The precise revisions we are proposing respecting the phytoflagellates are the following:

To the International Code of Botanical Nomenclature:

(331) Proposal to add italicized text to Principle I so that it reads:

"Botanical nomenclature is independent of zoological nomenclature (*phytoflagellates excepted*). The Code applies equally to names of taxonomic groups treated as plants whether or not these groups were originally so treated*."

(332) Proposal to add italicized text to Article 23.4 so that it reads:

"The specific epithet may not exactly repeat the generic name with or without the addition of a transcribed symbol (tautonym). *Specific names of phytoflagellates, validly published under the Zoological Code, are excepted from this rule.*"

(333) Proposal to add italized text to Article 36.2 so that it reads:

"In order to be validly published, a name of a new taxon of non-fossil algae, *the phytoflagellates excepted,* published on or after 1 Jan. 1958 must be accompanied by a Latin description or diagnosis or by a reference to a previously and effectively published Latin description or diagnosis."

(334) Proposal to add a new clause to Article 65:

"(c) The name of a phytoflagellate is illegitimate and is to be rejected if it is a later (junior) homonym of the name of a taxon of the same rank validly published under the International Code of Zoological Nomenclature or the International Code for the Nomenclature of Bacteria."

To the International Code of Zoological Nomenclature:

Article 1(c) Alter to read:
Independence.—Zoological nomenclature is independent of other systems of nomenclature in that the name of an animal taxon, the phytoflagellates only excepted, is not to be rejected merely because it is identical with the name of a taxon that does not belong to the animal kingdom. [For phytoflagellates, see Art. —]. The phytoflagellates are here defined as comprising:

Botanical class	Zoological order
Dinophyceae	Dinoflagellida
Cryptophyceae	Cryptomonadida
Raphidophyceae	Chloromonadida
Chrysophyceae	Chrysomonadida and Silicoflagellida
Prymnesiophyceae (=Haptophyceae)	Prymnesiomonadida (=Haptomonadida)
Eustigmatophyceae	Eustigmatida
Euglenophyceae	Euglenida
Prasinophyceae	Prasinomonadida
Craspedophyceae	Choanoflagellida (often grouped with the Zooflagellates)

Article 23(c) Alter to read:
Change of rank and combination.—The priority of the name of a taxon of the family group, genus group, or species group, the phytoflagellates only excepted, is not affected by elevation or reduction in rank within its group [Arts. 36, 43, 46], nor by any mandatory change in spelling consequent upon change in rank or combination [Art. 34].

Article 36(a) Alter to read:
Statement of the Principle of Coordination.—A name established for a taxon at any rank in the family group, the phytoflagellates excepted, is deemed to be established with the same author and date for taxa based upon the same name-bearing type (type genus) at other ranks in the family group, with appropriate mandatory change of suffix [Art. 34a].

Article 43(a) Alter to read:
Statement of the Principle of Coordination.—A name established for a taxon at either rank in the genus group, the phytoflagellates excepted, is deemed to be simultaneously established with the same author and date for a taxon based upon the same name-bearing type (type species) at the other rank in the group, whether that type was fixed originally or subsequently.

Article 46(a) Alter to read:
Statement of the Principle of Coordination.—A species-group name established for a taxon at either rank in the species group, the phytoflagellates excepted, is deemed to be simultaneously established with the same author and date for a taxon based upon the same name-bearing type at the other rank in the group, whether that type was fixed originally or subsequently.

Article 54

Names that cannot enter into homonymy:
The following cannot enter in homonymy:

(1) a name that is unavailable in the meaning of the Code (see Article 10a, except as provided in Articles 20 and 46c;
(2) a name that is excluded from zoological nomenclature [Art. 1b], unless it be applied to a taxon of phytoflagellates;
(3) an incorrect spelling, whether original [Art. 32c] or subsequent [Art. 33c]; and
(4) a name that has been suppressed for the purposes of the Principle of Homonymy by a ruling of the Commission [Art. 79b(i)].

Article 55(a) Alter to read:
Application of the Principle of Homonymy.—The Principle of Homonymy applies to all family-group

names other than those of phytoflagellates, including names of ichnotaxa at the family-group level. Names of phytoflagellate superfamilies, families, subfamilies, tribes, etcetera [Art. 35a] have priority only at their own rank.

Article 56(a) Alter to read:
Application of the Principle of Homonymy.—The Principle of Homonymy applies to all genus-group names other than those of phytoflagellates, including names of collective groups, and of ichnotaxa at the genus-group level [Art. 1d, 23g]. Names of phytoflagellate genera and subgenera have priority only at their own rank.

Article 57(a) Alter to read:
Application of the Principle of Homonymy.—The Principle of Homonymy applies to species-group names, other than those of phytoflagellates, that are or are deemed to be spelled identically [Art. 58] and are published originally or subsequently in combination with the same generic name [Art. 53c], including names of collective groups, and of ichnotaxa at genus-group level (see Articles 10d and 42b(i). Names of phytoflagellate species and subspecies have priority only at their own rank.

A new Article to be inserted, probably between the existing Arts. 57 and 58:

Article —.

Names of phytoflagellates.—Where names of phytoflagellates have been used at the same rank as names validly published under the International Botanical Code of Botanical Nomenclature, they are homonyms and the junior is invalid.
Example. The genus *Goniodoma* Zeller (1849: Lepidoptera) has priority over *Goniodoma* Stein (1883: Dinoflagellata–Pyrrhophyta).

We have pleasure in placing these proposals before your readership for consideration. We believe that our proposals, if accepted and incorporated into the existing ICBN and ICZN, can establish immediately the uniformity that is urgently required and obviate the need for any separate Code for the protists. Quite evidently these proposals will require cooperation between the International Botanical Congress, through its Bureau of Nomenclature, and the International Commission on Zoological Nomenclature if they are to be made effective. Changes to one Code, and not to the other, will negate the value of any unilateral action.

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Proposed by: F. J. R. Taylor, Department of Oceanography, University of British Columbia, Vancouver, Canada; W. A. S. Sarjeant, Department of Geological Sciences, University of Saskatchewan, Saskatoon, Canada and R. A. Fensome and G. L. Williams, Atlantic Geoscience Centre, Geological Survey of Canada, Dartmouth, Canada.