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Abstract: After a period of several decades of general neglect, biological systematics and taxonomy are again surfacing to the awareness of the scientific community and of policy makers. This we owe to the fact that they are the core disciplines of biodiversity research, now perceived to be a priority task in view of the impending threat of loss through extinction of a great number of species, and the wholesale destruction of ecosystems. Yet the renaissance of systematics and taxonomy is hampered by the inadequacy of the traditional rules governing the formation and use of scientific names of organisms. Names are a core aspect of human communication. They are the means by which scientists and laymen alike refer to organisms, the indispensable labels that enable the storage, retrieval and communication of any and all organism-linked data. This paper highlights the fundamental inadequacy of traditional nomenclatural *Codes* to fulfil their role. Past attempts to introduce new concepts into botanical nomenclature, such as the registration of new names and the stabilisation of the existing ones which are presently used, are mentioned – as well as their failure to gain acceptance by the small and highly self-centred community of specialists in the field. Recent attempts to launch competing sets of rules, the "*Phylocode*" in particular, are also discussed. While they may be a suitable means of breaking the dire monopoly of the *Codes*, they also have a dangerous destabilising potential. New solutions, which are doubtless needed, require great care lest we end up by undoing the achievements of the past.

Key Words: botany, zoology, codes of nomenclature, taxonomy, biocode, phylocode, names in current use, registration

Introduction

This paper endeavours to look dispassionately at the qualities and shortcomings of our present rules and techniques for naming organisms, seen against the background of today's needs of the systematic disciplines, data storage and accessing requirements, and user demands. I have tried to do justice both to the nomenclatural specialist's inside knowledge and the customer's naive expectations. While not neglecting the historical roots of the discipline, I shall place greater emphasis on possible solutions, on proposed alternatives and future prospects. None of this is new or highly original, but recent discussion of this general topic by data managers and general biologists shows, I believe, the desirability of having the subject competently reviewed.

Systematics Today: From the Taxonomic Impediment to the Global Taxonomy Initiative

Once the proud flagship of the natural sciences, systematic biology has seen its repute dwindling gradually over time. Two decades ago little was left of the former glory but the smell of old natural history cabinets, an association of dusty specimen stacks and cobwebby library shelves. The ageing clan of taxonomists, for the most part, revelled in self-pity. They tearfully declared themselves, or rather their lack of strength and resources, as an impediment – and up to a degree they were surprisingly successful in alerting general opinion to their needs and potential usefulness.

Some years ago, the "taxonomic impediment" was recognised as a cause of concern by the partner states to the Convention on Biological Diversity (CBD) and their Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). In 1996 the Conference of Parties (COP) to the CBD endorsed a Global Taxonomy Initiative (GTI) to promote capacity building in taxonomy. A workshop to "Remove the Taxonomic Impediment" took place (3-5 February 1998) in Darwin in Australia's Northern Territory, and the "Darwin Declaration" it produced (Anonymous, 1998) became an approved document of the COP. This opened new perspectives for systematic biology, both for achieving scientific respectability and for obtaining appropriate funding for research.

At present, taxonomy is getting a second chance. Will we taxonomists seize it? Conditions for success are not the same as they used to be. Efficiency and expediency are requested. Much of the research will be performed where biological diversity is greatest, in the tropical and subtropical realm of the developing world, far away from the traditional centres of learning where the treasuries of the past – specimens and publications alike – are stored. Data will have to be made readily accessible from any point on the globe. Bioinformatics are arising as a new discipline intimately linked with and complementary to taxonomic work. The change of our scientific environment is dramatic in its extent and speed. May we expect that nomenclature alone, a mere technicality albeit a fundamental one, will remain unaffected?

Nomenclature and Systematics: Unequal Siamese Twins

The nomenclatural *Codes* (see below) are careful to distinguish between the fields of nomenclature (the technique of naming plants and choosing between competing names, which is the *Codes'* domain) and taxonomy (the science [or art] of recognising, defining and circumscribing taxa). The rules of nomenclature steer clear of taxonomic decision-making, which is the taxonomists' proper prerogative.

Yet the world at large is notoriously unable or unwilling to make this distinction. Taxonomy is viewed through and judged by its most generally visible output, the names it produces. What essentially transpires of organisms and taxa, outside of systematic biology, is their scientific names. They appear on food wrappings, tins and pill boxes, in courts of law and patent offices, in newspapers, books, trade catalogues and on TV screens. Few of the people who read and use them have seen the corresponding plant or animal, and they could not care less. They confidently assume that a name is congruent with a given taxon (say, a certain genus or species), that those who use that name are competent to know what they are talking about and that nobody will ever disagree.

A basically benevolent commentary on taxonomy recently published in *Nature,* by a population biologist (Godfray, 2002), is pervaded by that old misunderstanding, mixing and confusing over and again issues of taxonomy and nomenclature. This paper has generated a lively discussion, still ongoing, which has so far failed to clarify that distinction. Yet the baseline of Godfray's argument is valid and his analysis of taxonomy, essentially correct. "Today" he writes "much of taxonomy is perceived to be facing a new crisis – a lack of prestige and resources that is crippling the continuing cataloguing of biodiversity"; and he concludes, "taxonomy can prosper again, but only if it reinvents itself as a twenty-first-century information science".

Godfray asks for the obvious, and he is not the first. To cite from his analysis: "Many taxonomists spend most of their career trying to interpret the work of nineteenth-century systematicists... A depressing fraction of published systematic research concerns these issues... The past acts as a dead weight on the subject." When writing this, he may have known (but does not cite) the study by Hawksworth (1992), who assessed the amount of time and money that goes into that kind of work: For botanists in the UK alone, time spent on nomenclatural matters adds up to 52 full-time research positions, which at that time were equivalent to £1.3 million per year. Just imagine: Taxonomists worldwide are spending 20% of their research time on futile nomenclatural exercises which at best confirm what was previously known and at worst upset well established plant and animal names, causing havoc in our discipline's information systems and earning their and our disrepute in the public eye – when their legitimate priority task is to describe and name unknown species, write monographic revisions of genera and families and prepare aids for identification. One more quotation from Godfray: "It is not surprising if funding bodies view much of what taxonomists do as poor value for money."

The Ancient Roots of Today's Nomenclatural Tools: From Aristotle to the "Black Code"

When Aristotle, in the 3rd century B.C., built the edifice of scientific biology during a single genial human being's lifetime (Greuter, 2002), one of his major achievements was the invention of the hierarchical system of classification that so many nowadays inappropriately attribute to Linnaeus. He did so with unrivalled simplicity and appropriateness, by coining the simple phrase: "a species is defined by the genus and the difference". From there on, for adepts of Aristotelian logics, any taxon ("species") was defined and named by being attributed to a higher-ranking taxon (the "genus"), and contrasted against all its sister taxa within that "genus" by a diagnosis (the "difference"). Linnaeus inherited that system of classification and naming, but at some point, just for convenience, he replaced the "difference" (that he

still considered as the "legitimate" specific name) by a single epithet (the trivial name). He thus invented binary species nomenclature, the major innovation that made his name immortal, as what he thought of as a minor by-product to his descriptive and classificatory needs.

Linnaeus (1736, 1737, 1750) published extensive nomenclatural rules in his works, but these are now utterly forgotten. They concerned, basically, the choice and creation of appropriate generic names and the art of coining concise and meaningful diagnostic phrase names for species. The formation of specific epithets was barely mentioned (Linnaeus, 1750), and no rules for choosing between competing names were given. None were indeed necessary, because one overriding rule was evident enough to Linnaeus's mind: that He was entitled to create and reject names as he deemed fit – a law to which none who mattered at the time dared object.

For obvious reasons, Linnaeus' unwritten rule died with its inventor. Some decades later, to forestall the spread of chaos, Augustin-Pyramus de Candolle (1813, 1819) postulated the first basic dogma of biological nomenclature, the principle of priority (see Greuter, 2000, for further details). His son Alphonse prepared the first set of full nomenclatural *"Laws"* (as he called them) for botany (A. de Candolle, 1867) and had them adopted by an international botanical congress. Following years of schism between European and North American plant taxonomists, between followers of the International *Rules,* first adopted by the Vienna Congress in 1905 (Briquet, 1906), and of the *American Code,* going back to the *Rochester Code* (Britton et al., 1892), the Fifth International Botanical Congress in Cambridge in 1930 eventually combined both into the first truly universal, modern set of rules (Briquet, 1935).

Zoological and botanical nomenclature drifted apart at an early stage. The first zoological *Code* (Strickland, 1843) was elaborated by a committee of which Charles Darwin was a member. The rules for naming animals had a chequered history (see Melville, 1995). They eventually came to diverge on several consequential points (e.g., the rule of secondary homonymy) from the Candollean principles, and even more from the 1867 botanical Laws. In the 20th century bacteriologists became dissatisfied with the botanical *Code* to which they had subjected themselves earlier and created their own set of rules, adding further to the dismemberment of biological nomenclature.

At present the names of organisms are governed by 4 different main *Codes*: the *International Code of botanical nomenclature* (Greuter et al., 2000), the *International Code of Zoological Nomenclature* (Ride et al., 1999), the *International Code of nomenclature of Bacteria* (Sneath, 1992) and the *Code of Virus classification and nomenclature* (included in Regenmortel et al., 2000). In addition, there are separate sets of rules for special categories such as cultivated plants (Trehane et al., 1995) and plant communities or "syntaxa" (Weber et al., 2000).

This concise historical sketch of biological nomenclature, which could easily be expanded into a full-size volume, may give a rough idea of how deeply rooted the tradition in this domain is and how much thought and discussion must have gone into the present bodies of law as the decades and centuries went by. The rules or *Codes* themselves are the least part of that tradition: There are wagon-loads of corollary literature, not to mention correspondence. All this is truly impressive – but is it not also tantamount to much dead wood?

My personal view is that yes, indeed, dead wood is plentiful in our *Codes* (except perhaps in the two recent ones, which cover bacteria and viruses). Worse than mere anachronisms, which may be pruned, is the dead weight of tradition. It is extremely hard to persuade the responsible bodies to agree to any novel approach that might, with all necessary caution, take care of the challenges that biology, and with it taxonomy, are facing today. Such innovations as had been devised in botany fell victim, when proposed, to what one might adequately describe as a revolt of druids against enlightenment. At the recent 16th International Botanical Congress in St Louis in 1999, the druids were totally victorious. It is not for nothing that the resulting latest edition of the botanical *Code* (Greuter et al., 2000) wears a black cover, to symbolise, as its preface suggests, "the sombre background of Reaction" that prevailed at St. Louis.

New Instruments and Novel Approaches: Are Innovations Doomed to Failure?

What, then, are these novel approaches and instruments which might confer a better image on biological nomenclature and thus on taxonomy as a whole? What measures offer themselves to enhance nomenclatural expediency and improve the security of its methods, while not causing damaging disruption to the names and information of the past? Three main schemes have been put forward that would fulfil these conditions,

which I shall briefly discuss under the three subheadings that follow.

None of these recipes have so far made their way into the zoological or botanical *Codes* (the first two have been successfully applied for many years by bacteriologists and virologists, though). I have no doubt that solutions very similar to those so far rejected by botanists and zoologists will be adopted at some point in the future. There is a major risk, however, that this may happen too late, when the *Codes* will have disgraced themselves in the public eye and been discarded; and that meanwhile other mechanisms to achieve the desired result may have been found and implemented, outside the codified nomenclatural realm. As we biologists know, prokaryotes still survive but most early metazoan and metaphytic groups have died out. Is this an omen? Are the botanical and zoological *Codes* doomed as dinosaurs and seed ferns were, with only the bacterial and viral rules surviving? The future will tell.

Standard Lists of Names

Godfray (2002) advocates a unitary (though periodically revised) consensual taxonomy, freely accessible online, as a panacea to the discipline's perceived miserable state. In a reply, Thiele & Yeates (2002) object that this would constitute an intolerable straitjacket to any hypothesis-driven science, such as taxonomy is. On the face of it they have a good point, but it is valid mainly because of Godfray's and their own confusing of taxonomy and nomenclature. Consensus taxonomy and consensus nomenclature are 2 different if interrelated concepts, and each should be considered on its own merits.

Godfray suggests that the state-of-the-art "unitary" (or as I would prefer, "advised") taxonomy of any group be laid down in peer-reviewed "web revisions" and declared as standards to be followed. This is not in itself a bad idea, provided that it does not hamper the progress of taxonomy. Why not temporarily "freeze" the classification of definite groups for the consumers of names, sparing them a steady, unnerving trickle of changes and reappraisals? From time to time new editions would be prepared, incorporating any unchallenged improvements and additions. If this policy is perceived as user-friendly, as I believe it is, its implementation should, in good logic, be user-driven. Taxonomists could be hired by user groups to write the "Web revisions" and to overhaul them at intervals when they become outdated. These, however, are considerations relating to taxonomy, and of marginal interest in the present context.

The nomenclatural component in Godfray's proposal is a built-in mechanism to devalidate earlier names that are unused under the "unitary" taxonomic hypothesis. This idea, while quite radical, is not new. There have been prior attempts to clean the nomenclatural slate, such as that of the British entomologist Lewis' (1875), who proposed that no early name be brought back into use unless it had "been kept alive by quotation as the true name in some work since 1842". Candolle's "Laws" of 1867 were admirably pragmatic in giving primacy to established usage over the strict application of the law of priority. When stressing the overriding importance of having unambiguous names and avoiding confusion, Alphonse de Candolle in effect championed the needs and requirements of modern information management. The *Rochester Code* of 1892 had a different emphasis. Its first tenet reads: "Priority of publication is to be regarded as the fundamental principle of botanical nomenclature". The polarity between pragmatism and legalistic strictness (and often between Europe and the New World) has overshadowed discussions on nomenclature ever since.

Bacteriologists, when submerged by the flood of old names that could not be properly interpreted but were a permanent threat to the names they used, decided to start anew. They listed all those names they wanted to maintain and decided to forget about the others, setting a new starting date (1 January 1980) for bacterial nomenclature. This was by no means a quick and easy decision: It required extensive discussion, documented in a flood of publications. Yet it was real progress and was successful.

Botanists were less bold in their approach. They devised a procedure whereby lists of useful names, meaning those that are needed under any currently held taxonomic opinion, might be granted wholesale protection against unlisted names, so that the latter need no longer be taken into account. The old names were not to be completely wiped out, as many of them still had some use, be it as basionyms for accepted names or as tags to which published information was attached. Sample lists, to show that the scheme was feasible and illustrate how it would work, were prepared for generic names of non-fossil plants and fungi, for plant family names, for species names in selected families, and for the

types of Linnaean generic names (Greuter et al., 1993; Greuter, 1993a,b; Jarvis et al., 1993). A relevant set of proposals (Greuter, 1991) to permit the wholesale protection of listed names in current use (or NCU, as they came to be known) was first presented at the 1993 Tokyo Congress where it gained substantial but insufficient support, then again in 1999 at St Louis where it fell victim to the druids.

Zoologists were perhaps more considerate and certainly more cautious than botanists, but also more successful. The list they propose to set up, piece by piece, is eventually to comprise all available (i.e. validly published) names that are known, whether in use or abandoned. As soon as a part of that list has been approved, the names on it will be beyond challenge and dispute, and the unlisted names will be gone forever. Description of the procedure, which is remarkably complex and demanding, extends over more than 3 pages in the new zoological *Code* (Ride et al., 1999: Art. 79). This is a perfectionists' approach and will require substantial investments of time and energy, but if it succeeds in part or as a whole, the result will be invaluable.

Registration of New Names

Imagine yourself discovering a new species that you want to describe, or revising a group of taxa and proposing a novel classification that requires transfers in rank or position. Would you not wish to make your resulting new names or combinations generally known and to be sure that they are brought to the public attention quickly and reliably, with some kind of official acknowledgement that they indeed exist? This is what registration would effect, at the small cost of supplying a registration office with a copy of your publication to prove its existence (an obligation which, in most cases, the publisher of the book or journal would comply with on your behalf).

It is reasonable to demand that a registration system, before it becomes mandatory, be tested as to its feasibility, reliability, speed and cost. This is what the delegates to the Tokyo Congress in 1993 reasonably requested when they agreed in principle to the registration scheme that had been proposed (Faegri, 1991; Greuter et al., 1994). The International Association for Plant Taxonomy (IAPT) agreed to organise and fund a full-scale trial run of the registration system, which worked successfully for the 18 months preceding the St Louis Congress (Borgen et al., 1997; Greuter & Raab-Straube, 1998: Raab-Straube, 1999). The result can still be consulted online on the Internet by anyone interested (Raab-Straube & Zimmer, 1999). It was obtained at relatively low cost (less than $65,000 for the first full year, including software design and salaries) (Borgen et al., 1998). During the trial run, almost 10,000 plant names were registered (not including the fungal names processed by the International Mycological Institute at Egham, U.K.), and the full data were accessible on the Web within a couple of days from receipt of the relevant information at the Registration Office. Table 1 is a sample of one possible use of such a system: to generate a list of new plant taxa based on type material from Turkey and published during the registration trial period.

A real success story, then, which entailed the IAPT's commitment to securing the long-term functioning of the process. But the druids rose up, and after the St Louis Congress nothing was left of this fully functional system of self-evident utility. The druids: that is we taxonomists, or at least a majority of us. What happened in 1999 is about the worst disservice we could render to our science. How to explain such an irrational decision to the world at large? How justify this blatant disrespect for elementary principles of scientific transparency and efficiency? Happily – and symptomatic of the general lack of interest in the arcane domain of nomenclatural necromancy – few outside our inner circles appear to have noticed.

Simplification and Unification of Codes

Arcane is probably the most appropriate word to describe the intricacy of the biologists' nomenclatural *Codes*. Most taxonomists facing a nomenclatural question of even moderate complexity are at a loss to answer it on their own and – wisely – ask for a specialist's counsel. I receive such requests by the dozen. Is this not a sign that something is wrong? Is there no way to make the rules simple, plainly worded and easily understood?

Well, it is not that easy. The *Codes* have grown over the decades, through successive meetings and editions, to become intricately woven organisms that are not easily modified in any of their parts without a risk of losing their integrity. Any change, minor as it may seem, may have unexpected repercussions quite unrelated to the original intent. The literature of the past is too manifold, too complex and too little explored to be ruled by simple laws, if major disruption is to be avoided. It is an

Table 1. Names of the 41 new taxa of *Spermatophyta* based on type specimens from Turkey registered during the registration trial phase, January 1998 to July 1999. The list was generated directly from the Registration Database (Raab-Straube & Zimmer, 1999); each name, as downloaded, is linked to full information on authorship, time and place of publication, type, etc.

Alkanna mughlae	*(Boraginaceae)*
Allium goekyigitii	*(Liliaceae)*
Allium rhodopeum subsp. *turcicum*	*(Liliaceae)*
Asphodeline sertachiae	*(Liliaceae)*
Asphodeline turcica	*(Liliaceae)*
Astragalus barboides	*(Leguminosae)*
Astragalus beypazaricus	*(Leguminosae)*
Astragalus ekimii	*(Leguminosae)*
Astragalus nigrifructus	*(Leguminosae)*
Bunium pinnatifolium	*(Umbelliferae)*
Centaurea hadimensis	*(Compositae)*
Chaerophyllum aksekiense	*(Umbelliferae)*
Chaerophyllum posofianum	*(Umbelliferae)*
Chamaecytisus gueneri	*(Leguminosae)*
Colchicum chalcedonicum subsp. *punctatum*	*(Liliaceae)*
Colchicum davisii	*(Liliaceae)*
Colchicum dolichantherum	*(Liliaceae)*
Colchicum heldreichii	*(Liliaceae)*
Colchicum imperatoris-friderici	*(Liliaceae)*
Colchicum inundatum	*(Liliaceae)*
Colchicum lingulatum subsp. *rigescens*	*(Liliaceae)*
Colchicum micaceum	*(Liliaceae)*
Colchicum minutum	*(Liliaceae)*
Colchicum munzurense	*(Liliaceae)*
Colchicum paschei	*(Liliaceae)*
Colchicum sanguicolle	*(Liliaceae)*
Crocus x paulineae	*(Iridaceae)*
Echinophora lamondiana	*(Umbelliferae)*
Fritillaria baskilensis	*(Liliaceae)*
Fritillaria sororum	*(Liliaceae)*
Minuartia asiyeae	*(Caryophyllaceae)*
Oenanthe cyclocarpa	*(Umbelliferae)*
Pentanema alanyense	*(Compositae)*
Prangos heyniae	*(Umbelliferae)*
Prangos platychloenae subsp. *engizekensis*	*(Umbelliferae)*
Sedum ince	*(Crassulaceae)*
Silene denizliensis	*(Caryophyllaceae)*
Spergularia sezer-zenginii	*(Caryophyllaceae)*
Teucrium ekimii	*(Labiatae)*
Tordylium ketenoglui	*(Umbelliferae)*
Vicia erzurumica	*(Leguminosae)*

undisputed fact that the *Codes* have not managed to bring about the stability and security of names that they were meant to achieve – but it is equally true that changes to the *Codes* have, more often than not, worsened rather than improved the situation.

In an era in which the traditional frontiers between plants and animals have become blurred, and when integrative biological research has timidly started to become reality, the existence of different *Codes* for the different major groups of organisms is increasingly felt as an anachronistic nuisance. For many years the International Union of Biological Sciences (IUBS), the foremost organisation in the biological sciences, has felt the need for nomenclatural rules common to all biologists. Expert committees were appointed to look into the question of feasibility (Hawksworth, 1995; Hawksworth & McNeill, 1998). Was it not conceivable that simple, basic rules could be devised for biology as a whole, using a unified terminology, an easily understood language and valid throughout the living world?

Well, conceivable it is, and not even difficult to realise – provided that only names to be created in the future be covered. This the IUBS Special Committee on Harmonization of Codes concluded (Greuter & Nicolson, 1996) when it worked out the basic draft of a *BioCode*. That draft, which went through two editions (Greuter et al., 1996, 1998), embodied a unitary terminology, provided rules for establishing names after an (unspecified) future date and for selecting among competing names. The number of articles in it is 41, two thirds-the number of articles in the botanical *Code* and less than half that in the zoological *Code*. As a matter of course it embodied the concepts of mandatory registration of new names and of protection of names appearing on approved lists.

One main criticism raised (Brummitt, 1997), and certainly a valid one, is that a *BioCode* thus conceived would be additional to the present *Codes,* so it would complicate rather than simplify matters. Therefore, if some solution along the lines of the *BioCode* does indeed eventually materialise, this is bound in my opinion to happen as a last step. When both the zoological and botanical *Codes* have recognised the principle of protected standard lists of names; when they both have incorporated the principle of mandatory registration of new names; when, that is, the mechanisms are in place to gradually reduce the field of application, and the weight,

of the existing bodies of law: Then and only then will the time have come to think of a common approach to biological nomenclature. Until such time, I am afraid that one must consider the *BioCode* debate (Hawksworth, 1997) as closed.

Revolution Ahead? Competing Nomenclatural Codes

The failure of the *Codes* to meet user demands, both of policy makers and taxonomists themselves, and the failure of the bodies responsible for the *Codes* to accept mature and well considered solutions: will these not lead inexorably to the *Codes* being supplanted by other, more satisfactory solutions? Such attempted revolutions happened in past times, as with the *Rochester Code* and *American Code* just mentioned or, in the domain of Zoology, with a number of similarly schismatic sets of rules, described by Melville (1995). Some were of considerable impact and duration, but none has survived. Three examples from recent years are worth mentioning.

The Reformed Code

Parkinson's (1990) *Reformed Code* was produced in reaction to the failure of two subsequent International Botanical Congresses (Sydney in 1981, Berlin in 1987) to do justice to, or even to seriously consider, Phil Parkinson's amendment proposals. The changes it includes, as compared to the official botanical *Code,* are not substantial but are rather semantic and structural, reflecting its author's idiosyncratic convictions. Even though it is bound to encompass some valuable ideas, the *Reformed Code* had no impact to speak of and will be noted, if at all, as an oddity and bibliographic rarity.

The New Biological Nomenclature

The same is probably true of Wim De Smet's New Biological Nomenclature (NBN), except that this embodied an entirely new and revolutionary concept. The NBN system (De Smet, 1991a,b) throws overboard some basic, established principles of biological nomenclature: scientific names are in Esperanto rather than Latin, species binomials have the family not the generic name as their first element. NBN, governed by an international association and a committee based in Belgium, is remarkably modern in that it incorporates the notions of stabilised lists and registration of new names. But for its narrow personal base, obvious lack of resources, and reliance on Esperanto, it might well have aroused interest and attained a degree of success. As it were, a mere 500 names were approved under the NBN system (Anonymous, 1991), only two of them pertaining to botany: *Maizoregnanoj,* the plant kingdom, and its type species *Maizo regnotypa* (= *Zea mays*). No subsequent activity or Web presence of NBN has been noted.

The PhyloCode

The last of the 3 "dissident" Codes is the best known: the *PhyloCode* (Cantino & Queiroz, 2000), controversially discussed in the "Points of View" column of *Taxon*, for instance. The list of relevant papers is much too long to be cited in full; one of the last published (Lee, 2002) must suffice. The present version of the *PhyloCode* is still a draft, yet it is already celebrated by its supporters as "one of the greatest advances in biological taxonomy since Linnaeus", their hope being that "the Linnaean codes are rapidly abandoned and replaced by the *PhyloCode*", and their fear, "that the two systems will co-exist for an extended period" (all citations from Lee, 2002). As politely but unequivocally demonstrated by Blackwell (2002) the *PhyloCode* is neither complementary nor compatible, and is plainly in competition with the current *Codes,* and any contrary pretence by its authors is sheer hypocrisy.

The main points in which the *PhyloCode* differs from the current *Codes* are as follows: it restricts itself, at least for the time being, to supraspecific taxa, and to one particular kind of such taxa, those which match the definition of clades; it does not recognise formal ranks; names are not linked to unique types, but to a set of descriptors (character states applying to, or elements included in or excluded from the named taxon) equivalent to a phylogenetic definition of the taxon; and it mandates registration prior to the publication of a name.

After careful analysis I can find no merit in the *PhyloCode,* can perceive no need for it, and consider it potentially dangerous to the present systems of scientific naming as a whole. Clades as defined by phylogenetic systematics are a particular kind of taxa and, as such, can be named without difficulty under the relevant current *Code*. The question of ranked vs. unranked taxa is trivial: relative ranking admittedly exists in phylogenetic systems as well, as they are hierarchically structured, and formal ranking under the current *Codes* is a mere device for expressing that hierarchy. The formal ranks have no "objective reality", nor does equal rank imply equivalent status of the taxa concerned. As far as I can judge, the distaste of (some) phylogenetic systematists for the

current rules resides in the fact that, being independent from taxonomy, these rules allow the naming of taxa other than clades. To put it more bluntly: The suggestion of replacing the current *Codes* with a *PhyloCode* stems from intolerance. All other arguments that have been voiced appear to be spurious.

However this may be, the *PhyloCode* operation might still be judged dispassionately if it had the decency to leave the current system of nomenclature alone; if it opted for using its own, independent set of names, perhaps in English if not in Esperanto, but anyway clearly distinct from the current scientific names of plants, animals and bacteria. The disturbing fact is that the *PhyloCode* chose to parasitise the extant system of names. In consequence, its adoption would inevitably lead to the dual use of the same name for distinct and often different concepts, thus undermining the principal function of biological nomenclature: to give access to biological information with a minimum of ambiguity. If, by misfortune, phylogenetic nomenclature should prove as successful as its promoters hope, this would result in the eventual collapse of the whole edifice of organismic nomenclature – without anything available to replace it. I shudder at the thought. Fortunately, most practising phylogenetic systematists are either tolerant or self-conscious enough to believe that their cause, if just, will ultimately prevail without the band-aid of an intransigent set of rules tailored to their needs. The sooner the *PhyloCode* is buried the better for biology.

Nomenclature at a Crossroads: Treasure Our Heritage by Caring for Its Future

At a time when biological taxonomy and nomenclature are entering the era of bioinformatics and facing a whole array of new options and demands, a number of valuable instruments are already in place and functioning. Prominent among them are the International Plant Name Index (Anonymous, 2002a), limited to vascular plants (mainly *Spermatophyta*); the Index Nominum Genericorum (Farr & Zijlstra, [2002]), listing generic names for all groups treated under the botanical *Code;* the Index to Organism Names of BIOSIS (Anonymous, 2002b), covering the names of animals, fungi, bryophytes and (some) algae; as well as complete, exhaustively documented name indexes for bacteria (Euzéby, 2002) and viruses (Anonymous, 2002c). Inventories of named species for all groups of organisms are projected, or in progress, in the Species 2000 Project (Anonymous, 2000), and for plants in particular, care of the International Organisation for Plant Information, IOPI (Anonymous, 2002d).

That is the good news. Less positive is the fact that, except for bacteria and viruses, none of these lists and inventories has achieved official status. In addition, as they have not been appropriately vetted – and indeed there is little incentive at present to undertake the huge task of vetting them – they are incomplete and inaccurate as to detail.

But let us suppose that, with help from technology and with due financial support engendered by the general interest in having a handy a trustworthy list of names available, complete coverage of a reasonably good quality can be achieved. Let us fancy that – why not – the All Species Foundation (Anonymous, 2002e) raises sufficient enthusiasm for the task to be funded. Lists and inventories so produced will inevitably acquire normative power; they will be resistant toward subsequent changes that the rules of nomenclature may require; they will, in effect, prevent the application of the current rules when they would lead to change. In short, they would make the *Codes* redundant and eventually obsolete.

This may appear to be a good thing to happen. Have I not just now been forcefully advocating the option of protecting standard lists of names? However, the lists I had in mind were to be produced under the control of the nomenclatural bodies now in place, taking full advantage of their experience and skills. In my opinion such critical control and official governance is essential, because there is nothing, nor is anything in sight, that could replace our *Codes*.

To quote Godfray (2002) one last time: "The rigidity built into the current rules and codes of taxonomy [sic!] is part of their success, and changes should not be made lightly. But I suspect these rules are now a brake on progress, imprisoning the subject in outdated methodologies... We must preserve the achievements of 250 years of distributed taxonomy, dispensing with the bad legacy of the past but retaining the good."

I wholeheartedly agree. Our rules, which we continue to need, must continue to work properly in a generally acceptable way. To this end, it is necessary to rescind the primacy that the rules now give to historical faithfulness and, supposedly, fairness (which is a fiction anyway: what counts in nomenclature is not the quality of the scientific

invention but the adherence to formal requirements); and instead, to place full stress on the essential function of our naming system, which is to ensure access to biological information in the most expedient, most secure, yet generally understood way possible.

Unless we achieve such change, the dead weight of centuries of fact-finding and endeavour will bog down our research and make it increasingly unpalatable in the watchful eyes of our peers. To bring about the change, however, we ourselves, taxonomists, must take the lead.

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