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The Forensic Taxonomic Debate on *Cannabis*: Semantic Hokum

It is true that you may fool all of the people some of the time; you can even fool some of the people all the time; but you can't fool all of the people all the time.
—Abraham Lincoln

Since 1972 there have been numerous cases in North America in which the applicability of legislation governing marihuana has been challenged on the basis of a superficially meritorious argument. In brief, the defense has been advanced that there are several species of the marihuana plant, and since most legislation refers only to the species *Cannabis sativa*, the other species and marihuana obtained from such other species are not proscribed. This defense has been used so extensively that it has become a textbook exemplar [1]. Recent articles supporting its validity [2-4] have exacerbated the situation.

The ploy is advanced on the basis of two considerations: (1) legislation in North America concerned with marihuana almost invariably refers to marihuana in the general section, and to *C. sativa* in the definitional sections, and (2) in interpretation of law the specific takes priority over the general. The defense is based on the thesis that the scientific name *C. sativa* is more specific than the vernacular or common name marihuana, and the success of the ploy has been predicated on the widespread assumption that scientific names necessarily refer to unambiguous, uniquely circumscribed entities. In this presentation I point out that these assumptions are unwarranted.

It may be noted that the taxonomic debate concerning *Cannabis* arose seriously in 1972 only after an enterprising lawyer initiated the research which led some botanists to reverse their opinion on the appropriate use of the name *C. sativa* to the opinion now held by the botanists testifying for the defense in these cases [5]. It is inevitable that other enterprising attorneys will attempt to apply the arguments put forth in the current taxonomic debate over *Cannabis* to legislation governing other materials. The taxonomic ploy being used to circumvent marihuana legislation is theoretically applicable to every living thing and its products, whether denoted by a scientific name or a vernacular or common name. The present paper is intended to forestall the potentially catastrophic consequences that could result from wholesale similar challenges to legislation governing many materials. It should be understood that the taxonomic debate concerning *Cannabis* represents the first rigorous examination of the implications of biological taxonomy for legislation. The importance for forensic scientists of acquiring an understanding of the theoretical issues should be manifest.

The taxonomic ploy concerning *Cannabis* has been advanced, most inappropriately,

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with scientists representing the defense concerning themselves exclusively with demonstrating the existence of certain variants of *Cannabis*. These scientists argue that the magnitude and nature of the differences characterizing these variants of *Cannabis* make it advisable to recognize them as species. My own studies [6–19 and a paper in preparation with Dr. Arthur Cronquist] contradict this conclusion. I wish to stress, however, that the approach of debating the conflicting scientific claims regarding the taxonomy of *Cannabis* is an academic red herring, serving to deflect appreciation of the essentially semantic issues.

The taxonomic debate on *Cannabis* is properly and simply resolved by examining the use of the name *C. sativa*. This becomes evident after certain restraints and freedoms of biological nomenclature are appreciated. Countering the current ploy and similar maneuvers which may arise then becomes a comparatively simple matter. Toward this end, this paper is concerned with elementary clarification of the subjective nature of taxonomy and certain ineluctable ambiguities of biological nomenclature. The following treatment, although it may be quite demanding of the uninitiated, is simplistic and highly abbreviated. For detailed information on botanical taxonomy, readers may consult the advanced treatment of Davis and Heywood [20] or any of a number of other good, recent texts [21–24]. More detailed information specifically on the use of nomenclature in botanical taxonomy can be obtained in *The International Code of Botanical Nomenclature* [25] (hereinafter referred to as the *Code*). A superb elementary introduction to the practice of nomenclature by taxonomists has been presented by Jeffrey [26].

Classification and Nomenclature

There are two important phases to taxonomy (the discipline concerned with the classification and naming of living things). These two aspects are known as classification and nomenclature. Although both phases are indispensable, the former is much more important than the latter. The phase of taxonomy known as classification involves scientific studies serving to set limits to groupings of living things and to assess their similarities and relationships. There are critical intrinsic limitations on the extent to which taxonomists can generate objective classifications as well as practical limitations governed by the state of knowledge at a given time. Appreciation of the inevitable subjectivity of classifications results in considerable deflation of the claims of the defense about the taxonomic ploy over *Cannabis*.

When the classification phase is complete the variants have been delimited and arranged according to what are judged to be the totality of their similarities and differences, but they are not yet named. At this point nomenclature becomes the concern of the taxonomist. Nomenclature involves naming the variants and producing a classification, that is, a system of names that labels and categorizes the variants perceived. Although this naming of variants is precisely formalized, it may justifiably be described as simply a clerical phase, very crudely comparable to the registration of names associated with birth or marriage and death certificates. Clarification of the remarkable ambiguities associated with the naming conventions of biologists serves to further deflate the claims of the defense with regard to the taxonomic ploy concerning *Cannabis*.

Conventions of Biological Nomenclature

In naming groups of plants, taxonomists utilize one or more Latin (or latinized) words, depending on the rank of the group. Some of the progressively more inclusive rankings are variety, subspecies, species, genus, and family. Names of families and genera are uninomials, for example the (hypothetical) genus name *Planta*. Names of species are binomials, for example *Planta americana*. Names of varieties are trinomials

and are written in the form *Planta americana* var. *chinensis*. Taxonomists usually append an abbreviation of the name of the author of a biological name to the end of the name, for example *Planta americana* L., where L. stands for Linnaeus, who we will suppose coined the name. The descriptive terms like *americana* and *chinensis*, which are appended to the genus name, are known as epithets. For ease of memory the epithets used in the example which is developed at length in this paper are all geographical. It should be noted that epithets need not be accurate as descriptive terms, although obviously the authors who coin names usually believe them to be appropriate. *Planta americana* need not come from America, nor need *Planta americana* var. *chinensis* be present in China.

Botanical nomenclature is applied in conformity with numerous regulations specified in the *Code*. Fundamental to biological nomenclature is a referencing procedure, known as the type method, designed to stabilize the use of biological names. Before names can even be considered for use by the scientific community (at which point botanists call the names "legitimate" and zoologists term the names "available") many conditions must be satisfied. Frequently names may not be employed unless a type specimen representing the named group has been specified and permanently preserved. This is not to provide an ideal standard of comparison for the group (as one might expect) but merely to establish permanently a reference point for the name which is then tied to the specimen. This modus operandi has been adopted because scientists are continually changing their conceptions of groupings of biological variants. Thus one cannot have a permanent standard for the group, but through the type method one can have standard reference points for the names. This enigmatic and recondite system, although extremely effective for establishing names, is capable of generating surprising ambiguities. The type method is a fairly recent innovation in plant taxonomy, becoming fully established only in 1935, and there are many older names not yet tied to specimens. Such names are increasingly being coupled with type specimens by modern biologists to facilitate interpretation of the older names.

Since the agreed starting point of 1753, botanists have accumulated a huge excess of names for many groups such as *Cannabis*. One important reason for this is that many biologists have published new names in ignorance of each other's work. By agreement a given group can have only one correct name at a given rank. However, there may be different correct names denoting the groups when different taxonomists assign them to different ranks. The correct name at a given rank is the first name appropriately published at the rank in question which is applicable to plants falling within the boundaries of the grouping perceived. By this principle of priority, the epithet of the earliest name (at the rank in question) associated with the grouping in question must be adopted. In the event that no name is found applicable to a grouping that a taxonomist wishes to have named, the taxonomist creates a new name, simultaneously associating that name with a new type specimen.

There is one exception to this rule important to understanding the example to be presented. When a given species has two or more varieties, then the name of the variety in which the type specimen of the species is found automatically uses (thereby repeating) the specific epithet as the varietal epithet. Thus in the example to be presented, in Classification 2 of Table 2 one finds a variety whose correct name is *Planta americana* var. *americana*. If it were not for the special provision, then the correct name would be *Planta americana* var. *mexicana*, since the earliest type specimen at the varietal rank (Table 1, Fig. 1) is associated with the epithet *mexicana*.

Figure 1 illustrates an exemplary problem. Taxonomists regularly confront much more complicated situations than this simple example, which nevertheless requires intellectual fortitude on the part of those with no experience in this subject. In this artificial example (which is very similar to the situation in *Cannabis*) a hypothetical genus *Planta* is represented by three dozen daisylike plants, six of which are type specimens at the species

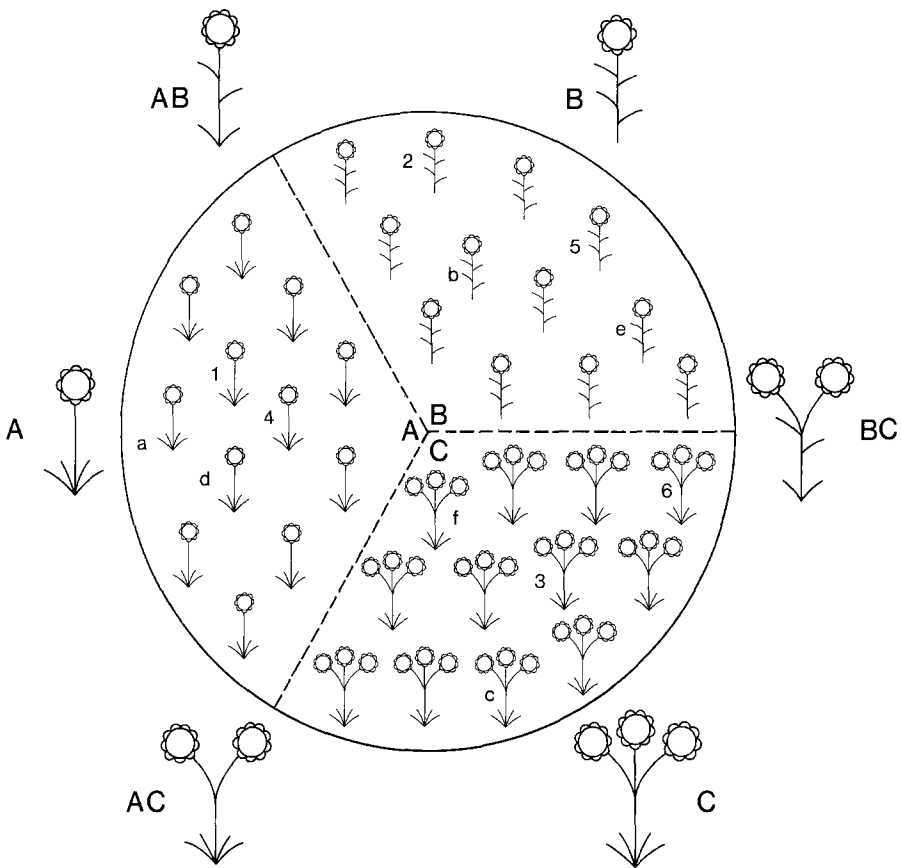


FIG. 1—A “pie” containing three variants, A, B, and C. Around the periphery possible intermediate plants (AB, BC, and AC) are indicated. The three variants may be grouped and ranked in twelve different ways, as shown in Fig. 2. Twelve specimens of each variant are enclosed in the pie. Of these, numbered specimens are type specimens at the specific rank and lettered specimens are type specimens at the varietal rank (see Table 1). These type specimens dictate names which must be adopted, depending on which of the twelve possible classifications of these variants is adopted (see Table 2).

level (named historically in the sequence 1–6) and six are type specimens at the varietal rank (named historically in the sequence a–f; see Table 1). For simplicity, we are assuming that all available names have been tied to type specimens. It will be noted that there are three basic variants: A has basal leaves, a bare stem, and a single flower; B has its leaves borne along the stem and also has a single flower; and C has basal leaves, a bare stem, and several flowers. We shall now proceed to examine the ways in which these variants may be named, with the goal of gaining an appreciation of how scientific names of living things are constrained and, more particularly for our purpose, of establishing the ways in which the use of scientific names is not constrained.

Subjectivity of the Classification Phase of Taxonomy

As noted earlier, in the classification phase of taxonomy, taxonomists study organisms to delimit variants and assess their similarities and relationships. This is carried out by examining the appearance and other attributes of the creatures being examined. Botanical taxonomists consider that outward appearance provides indispensable and primary cri-

TABLE 1—*Nomenclatural history of an example. Names with asterisks have priority because they are the earliest available in given sectors of the "pie" in Fig. 1. Other names must be ignored here but might acquire priority if the pie were to be sliced in different ways. In this example the genus name *Planta* has priority over the genus name *Herba*, and the decision was made to recognize only one genus, which is accordingly named *Planta*.*

Type Specimens	Name Associated with Type Specimens	Date of Formal Description
1	<i>Planta americana*</i>	1753
2	<i>Herba asiatica*</i>	1800
3	<i>Planta europaea*</i>	1850
4	<i>Planta australiensis</i>	1900
5	<i>Herba africana</i>	1925
6	<i>Planta groenlandica</i>	1950
a	<i>Planta americana</i> var. <i>mexicana</i>	1775
b	<i>Herba asiatica</i> var. <i>chinensis*</i>	1825
c	<i>Planta europaea</i> var. <i>italica*</i>	1875
d	<i>Planta americana</i> var. <i>californica</i>	1910
e	<i>Herba asiatica</i> var. <i>mongoliensis</i>	1920
f	<i>Planta europaea</i> var. <i>hispanica</i>	1930

teria indicating that variants merit recognition. Additionally, supporting criteria, such as breeding interfertility, chemistry, and anatomy, are often available. Competent taxonomists labor carefully in these activities, often making discoveries of immense practical and theoretical significance. The following comments pointing out limitations of taxonomy should not be misconstrued as denigrating the importance of this discipline.

One of the important limitations of the classification phase is the baffling complexity of living things. It is often difficult or even impossible to be sure what a variant is, and often groupings are delimited very arbitrarily. The problem of delimiting variants can be compared to dividing up a "pie," encompassing all plants being studied, to segregate each representative of a given variant within its own sector. Establishing where the pie should be cut can be very difficult, but in our example we will assume that satisfactory locations have been found (Fig. 1).

Once the variants have been recognized (or at least arbitrarily defined), they are arranged in a series of increasingly more comprehensive groups. Grouping is based on degree of similarity or presumed or demonstrated relationship. First the most similar or most closely related variants are grouped. Then the most similar groups of groups of variants are in turn grouped. This process continues until one has achieved a hierarchical grouping of all the variants.

The two Achilles' heels of taxonomy are found within the procedures described in the last two paragraphs. As noted, the delimitation of variants and grouping of variants is arranged by similarity or relationship. The first Achilles' heel is that there is not, and quite probably can not be, one universally acceptable correct measure of similarity or relationship. The second Achilles' heel is that there is not, and quite probably can not be, one universally acceptable correct method of grouping. The reader is referred elsewhere for discussion of these two very technical areas of taxonomy [27] and for detailed information on the failure of taxonomists to find one correct way of creating classifications [28].

Frequently, one cannot judge the relative merits of alternative groupings without reasonable doubt, particularly when the variants are closely related. In our particular example we shall consider all possible groupings of our three variants. These can be grouped in four different ways, as is evident in any column of the organizational charts shown in Fig. 2. Taxonomists interpret such figures in various ways, notably either as

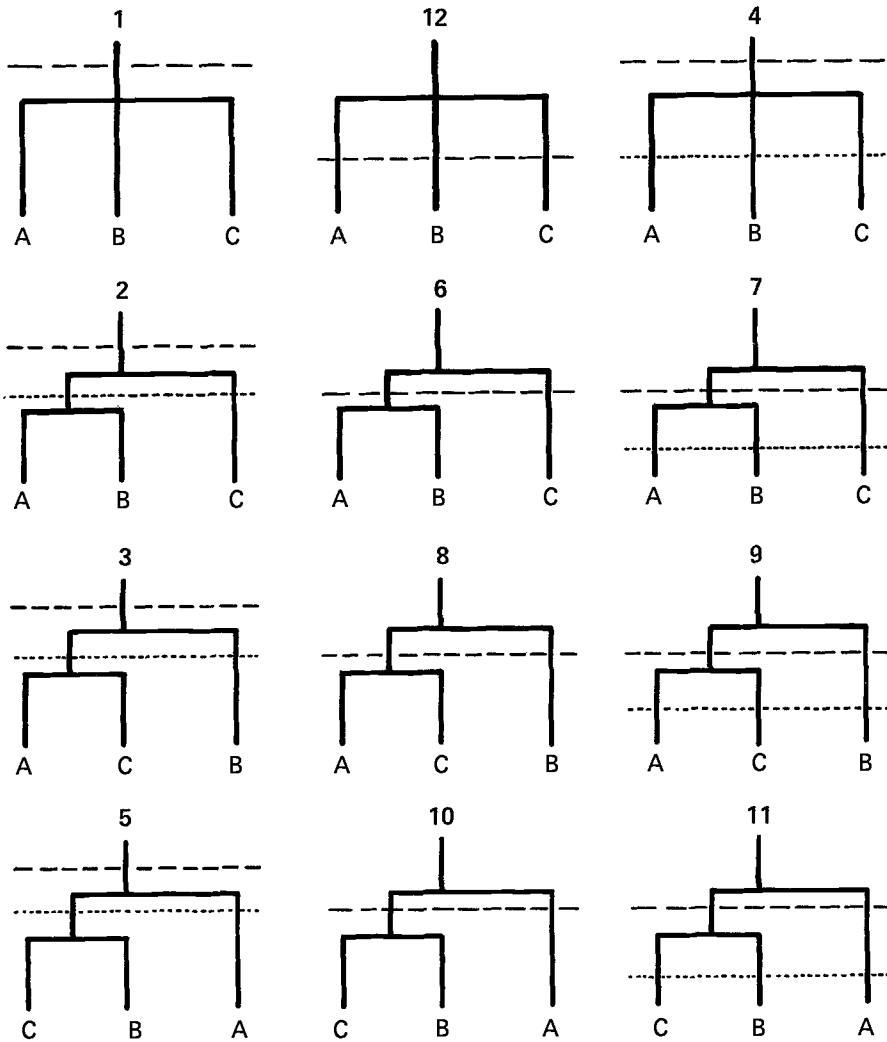


FIG. 2—Organizational charts showing how the variants illustrated in Fig. 1 may be grouped (note any column) and ranked (note variations within rows). Broken line indicates species rank and dotted line indicates variety rank. Where these lines cut vertical lines leading to variants A, B, and C, the variants connected below the point of intersection are grouped into a species or variety, respectively. These organizational charts are numbered according to the classifications indicated in Table 2, where the names which must be adopted for each variant are given.

pedigree histories indicating evolutionary relationships or simply as indicators of how much alike the variants are.

Next, we consider the important problem of assigning rank. It should be noted that in plants which can interbreed freely, such as the variants of *Cannabis*, one frequently finds intermediates, as shown in Fig. 1, where AB, BC, and AC are intermediate between the variants A, B, and C. When the number of intermediate organisms is great, and it is consequently difficult to delimit each variant, there is rarely justification for naming the variants. When the number of intermediates is somewhat more limited, but still very appreciable, by tradition the variants may be recognized as varieties (or as subspecies), but not as species.

Except for these basic caveats, it is generally recognized in botanical taxonomy that the assignment of rank to variants is an arbitrary process. This simple consideration alone means that many variants which one taxonomist considers deserving of being called species, another taxonomist is entitled to call varieties. This is one very important reason why biological nomenclature is indisputably subjective. In Fig. 2 there is shown in each of the four rows three different ways rank can be assigned to each of the four groupings pointed out in the preceding paragraph. If we chose to recognize additional ranks such as the subspecies, the number of combinations would be very much larger. Note that the organizational charts have been sliced horizontally, placing the variants into ranks as species, or as species and varieties.

Ambiguities of Biological Names

Finally we come to the nomenclature phase of taxonomy and consider how the groupings we can recognize should be named. In Fig. 2 we have found that the three variants can be grouped and ranked in twelve different ways. We now seek out the correct names for each of the variants in the twelve different classifications. We do so by applying the nomenclatural principles discussed regarding priority of names. The names applied to each variant, depending on which of the twelve classifications is adopted, are shown in Table 2. It should be stressed that when one of the classifications is adopted, there are absolutely no options regarding appropriate names; the *Code* fully specifies the names which must be adopted. (Those with sufficient stamina will gain insight into the working of the type method by noting how the names in Table 2 have been derived.)

Comparison of the twelve classifications shown in Table 2 reveals a phenomenon which may appear devastatingly illogical. This is the fact that the same names are often employed differently. For example, the name *Planta americana* may be applied to only A, only A and B, only A and C, or A, B, and C together. Thus, biological names are inherently potentially ambiguous. The fact that those advocating different classifications often *must* use the same name (as in our example), despite their knowledge that other taxonomists may be using that name in a different sense, will strike those unfamiliar with taxonomy as appallingly confusing. This consideration illustrates the error of the supposition that biological names are inherently more specific than common or vernacular names.

A taxonomic group is completely specified by three properties: rank, circumscription, and position. Ambiguity may result from manipulation of any one of these determinants. Rank is a fairly obvious characteristic. In Table 2, note that variant C is alternatively ranked as a variety or as a species. Circumscription refers to inclusiveness of the grouping. In Table 2, note that variant C is alternatively associated with both A and B, or with A only, or with B only, or is segregated by itself. Position refers to the placement of a variant under a more inclusive category. Thus, in Table 2, C is alternatively placed as a variety of the species *Planta americana* or as a variety of the species *Planta asiatica*.

To date, the dispute in *Cannabis* has been concerned with differences of opinion regarding rank and circumscription. However, position provides perhaps the best means of sophistic manipulation, and forensic scientists should be aware of this possibility. Facetiously, by varying position one can accomplish miraculous feats of transformation. Consider apples (*Malus pumila*) and oranges (*Citrus sinensis*). We can turn apples into oranges simply by writing *Citrus pumila*; alternatively, oranges are changed into apples by writing *Malus sinensis*. When we deal with variants as different as apples and oranges, it is easy to see through this semantic trickery. The plants which produce apples are so obviously similar to members of the rose family (Rosaceae), whereas the plants which produce oranges are so obviously similar to members of another quite distinctive family (the Rutaceae) that *no* competent taxonomist today would sanction such drastic name

TABLE 2.—Twelve possible classifications of the three variants shown in Fig. 1. Applicable names apply to columns, and the classifications are shown in rows. The numbers of these classifications correspond to those shown in Fig. 2. Given any one of these twelve classifications, adoption of the eight names shown is dictated by the type specimens indicated in Table 1 and Fig. 1. Note the ambiguity of names prevalent between the different classifications.

Classifi- cation No.	<i>Planta</i>	<i>Planta</i>	<i>Planta</i>	<i>Planta</i>	<i>Planta</i>	<i>Planta</i>	<i>Planta</i>	<i>Planta</i>	<i>Planta</i>
	<i>americana</i>	<i>asiatica</i>	<i>europaea</i>	<i>americana</i> var. <i>americana</i>	<i>americana</i> var. <i>chinensis</i>	<i>americana</i> var. <i>italica</i>	<i>asiatica</i> var. <i>italica</i>	<i>asiatica</i> var. <i>italica</i>	<i>asiatica</i> var. <i>italica</i>
1	A,B,C	...	...	...	...	...	...	...	...
2	A,B,C	...	...	A,B	...	C	...	...	...
3	A,B,C	...	...	A,C	B	...	...	...	...
4	A,B,C	...	...	A	B	C	...	...	...
5	A,B,C	...	...	A	B,C	...	...	...	...
6	A,B	...	C	...	...	...	...	...	...
7	A,B	...	C	A	B	...	...	...	...
8	A,C	B	...	...	...	...	...	...	...
9	A,C	B	...	A	...	C	...	...	...
10	A	B,C	...	...	...	...	...	...	...
11	A	B,C	...	...	...	...	B	...	C
12	A	B	C	...	...	...	...	...	...

transfers. But with more similar plants, this type of exercise becomes increasingly acceptable to an increasing number of taxonomists. *Cannabis* and the hops plant (*Humulus lupulus*) are very similar, and indeed the hops plant was once named *C. lupulus*. The fact that hops plants and marihuana plants are positioned in different genera simply reflects present opinion, which could be altered in the future. Although the exercise is so transparently specious that it is unlikely to be carried out, one could transfer marihuana plants to the hops genus and then claim that what has been proscribed is a different genus entirely.

Extent and Nature of Taxonomic Disagreements

It must be emphasized that there is no formal procedure for judging the wisdom of a classification, although often the collective judgment of the taxonomic fraternity leads to the widespread adoption of particular nomenclature. In practice, at the species level there is often remarkable unanimity concerning whether given groups of plants deserve to be recognized as species either tentatively or confidently. With the accumulation of knowledge the use of biological names, especially species names, becomes increasingly stable. Indeed an overwhelming consensus of taxonomic opinion prior to the eruption of the present forensic taxonomic debate held (and continues to hold) that all variants of the genus *Cannabis* should be assigned to the species *C. sativa*. If one assumes, as one must, that the minority of botanists now advocating a redefinition of this nomenclature is not guilty of foolishness or charlatanry, then it follows that there are at least minimal grounds for respectable differences of opinion regarding appropriate scientific use of the name *C. sativa*. It should be appreciated that differing uses of scientific names is not at all infrequent, since different classifications often coexist. Also, changes in the consensus of use of given scientific names occur regularly and often gradually with the passage of time.

At this point those previously unfamiliar with the properties of biological nomenclature may inquire in exasperation just what is scientific about scientific names whose import is potentially so ambiguous and mutable. Even worse, the esteem in which taxonomy and taxonomists are held might be considerably lowered. These judgments, however, reflect unrealistic expectations of biological nomenclature and a misunderstanding of the nature of taxonomy. Although variation in some groups is so obviously structured that all taxonomists can agree on the merits of a classification, in many groups variation is inherently complex and inconducive to simple and obvious classification. Biological nomenclature is merely the veneer of the product of taxonomists, who are concerned basically with assessing biological variation in groups of organisms. Names are very important for categorizing and referencing this variation, but it is generally conceded that biological names cannot reflect the complexity of relationships of living things in a universally acceptable fashion. It should be pointed out that, generally, the naming system devised by taxonomists has proven remarkably useful. Ambiguities of biological names pose no insurmountable difficulties for taxonomists, who appreciate the inherent semantic problems, and the secular use of biological names has resulted in few problems of communication.

As I have emphasized, however, subjective judgment is inevitable and becomes increasingly important when one considers closely related groupings such as the variants of *Cannabis*. A given classification is a work of both science and art. A judgment that one classification is superior to another is to some extent like a judgment that one work of art is superior to another. Such judgments reflect philosophy and values as well as the competence of the judges. It has been said that a good classification is one which has been produced by a good taxonomist. This is of course circular, but it serves to point out that there is no ultimate standard of merit for classifications.

Forensic Implications

Biological taxonomy is obviously often quite unlike the ordering and nomenclature of inanimate objects, for which there might be only one, highly stable, universally accepted scheme of classification (for example, the periodic table of the elements). Clearly biological names can be highly ambiguous and often may be used in good conscience by different people to denote different things. This may seem unsatisfactory, but it is an inexorable difficulty which must be faced. The obvious solution is to inquire specifically what the user of a biological name means, rather than to address the often unresolvable issue of what constitutes best scientific use at a given time. In particular, the usages of taxonomists who testify on an issue in court must be treated with extreme circumspection. A taxonomist who testifies that there are several species of the genus *Cannabis* "with scientific certitude" (an odious and highly misleading phrase currently in vogue with defense attorneys utilizing the taxonomic ploy) is really saying only that he *chooses* to regard variants as species; another taxonomist is perfectly free to regard the same variants merely as varieties. A taxonomist who claims to have studied "well-authenticated material" of a particular taxonomic grouping (a gem of circularity frequently advanced in the current *Cannabis* debate) is seen to be claiming merely that he regards the material as representative of his particular arbitrarily chosen circumscription; other taxonomists with different conceptions of how groupings should be circumscribed can and may regard the material as poorly representative of their particular groupings.

Recently defense attorneys have pointed out that perhaps a dozen botanists have been persuaded to testify that they have abandoned their previous opinion that *Cannabis* was composed of only one species and now recommend that the genus be split into several species. When viewed in perspective, however, it can be seen that the few botanists who have been converted to this stance are merely advocating a redefinition of names. It has been suggested that the forensic taxonomic problem can be avoided entirely simply by redefining legislation, proscribing all species of the genus *Cannabis*, and some states are following this course. Unfortunately there is nothing (theoretically at least) to prevent the defense from enlisting taxonomists to counter this move by redefining variants of *Cannabis* as different genera! (Ominously, some taxonomists are already claiming that there is at least some justification for such a step.) This verbal battle of redefinition could be continued upward to still higher ranks *ad absurdum*.

When one has acquired an understanding of the inherent subjectivity of taxonomy and the potential ambiguity of biological names, the absence of merit of the taxonomic ploy in *Cannabis* becomes apparent. The reason that this inspired, artful subterfuge has been so successful rests simply on the fact that those who are not taxonomists are not accustomed to interpreting biological names. If laws governing individuals classified by the term captain were in dispute there would be no similar problem of interpretation, since we all recognize that this rank has been designated to individuals by a process of subjective judgment and that this label may have very different connotations. The absurdity of the taxonomic ploy becomes apparent when one considers how it might be applied to man himself. Using exactly the semantic tactics employed in the present forensic debate, one might argue that certain of the races of man are not entitled to the privileges of human beings (*Homo sapiens*), or alternatively are exempt from legislative controls, because they really are different species. No doubt a minority of respected anthropologists could be brought into the courtroom to raise the specter of reasonable doubt concerning the comprehensiveness of the scientific name *H. sapiens* or of the common name man.

I wish to make clear that I intend no criticism of defense attorneys in the taxonomic forensic maneuver in *Cannabis*; they simply have acted in the interests of their clients. I also certainly would not accuse the highly respected and qualified scientists who have

testified for the defense of consciously participating in an attempt to hoodwink those innocent of the complexities of biological nomenclature; scientists assisting the defense simply have not been requested to clarify the difficulties inherent in biological names.

There is one circumstance in which the claim that a given variant is covered by a given name beyond peradventure is not valid. This occurs when a hitherto unevaluated allied variant is discovered, whose characteristics place it clearly beyond the limits of the conception entertained by all taxonomists who have employed the name in question. For example, if a race of man with feathers and three eyes was found to exist, there would likely be legitimate grounds for questioning whether it could be interpreted as a human being (*H. sapiens*) as this name has been understood traditionally. Extreme variants which could raise this kind of question have not been found in *Cannabis*. Should they be discovered, there are two possibilities: (1) the variant is deficient in the chemicals which stimulated proscrition, and therefore identification procedures simply establish that the material is not illegal; and (2) the variant contains the undesirable chemicals of interest, and governing legislation is possibly inadequate. I would point out, however, that an unexplored consideration may serve to salvage the legislation in this circumstance. Definitional sections of statutes concerned with marihuana frequently proscribe tetrahydrocannabinol (THC), the chief intoxicant of cannabis resin. Accordingly it may be argued that anything containing THC is proscribed. However, it depends on the wording of the statute whether or not this interpretation is applicable. For example, if a species of carrot were discovered to contain THC, it could be argued that the legislative intent of the statute can not be construed to proscribe such carrots.

Obviously it is critical in drafting and interpreting legislation where biological names are used (just as when vernacular names are used) that the comprehensiveness of the names be clear. Doubtless legislators in the past used so-called scientific names in the mistaken belief that such names are inherently more satisfactory than vernacular names. In fact scientific names usually are more satisfactory, but simply because the groups denoted have generally been well described. However, the exploitation in the current taxonomic debate over *Cannabis* of the ambiguities of scientific names is, perhaps, reason for hesitation before adopting scientific names in future legislation.

It is to the great credit of the judiciary in America that most judges have comprehended that the forensic debate in *Cannabis* is semantic, not scientific (although few judges have become sufficiently cognizant of the fact that semantics are an inherent consideration governing the use of biological names). Most recent cases in which the taxonomic issue in *Cannabis* has been raised have been adjudicated on the basis of the semantic issue of interpreting the legislative intent behind the use of the name *C. sativa*. In most cases judges have ruled that the narrow definition of this name advocated by the minority of taxonomists conscripted by the defense has no bearing on the issue. Arguments of the defense based on considerations of statutory construction and interpretation have received very little sympathy, except in the case of *U.S. vs. Collier*, (Crim. No. 43604-73, Sup. Ct D.C., March 19, 1974, 14 CrL 2501) discussed at length by Fullerton and Kurzman [3]. However, no expert was available to the state in *Collier*, and in any event this interpretation has now been rejected by a higher court [*U.S. vs. Walton*; 16 B.N.A. Cr. L. 2415 (Feb. 75)]. As of this writing, I am aware of no case where the state's position was soundly presented and the taxonomic ploy was nevertheless successful. An extensive list of important American state and federal cases is presented in Ref 14. The Fifth Circuit Court of Appeals has noted that the issue has been decided by the Second and Third Circuits and has stated agreement with the decision.

In Canada the issue has only begun to be exploited, and the decisions of the major test cases to date (*Regina vs. Deslauriers*, Toronto, 1974; *Regina vs. Perry et al*, Vancouver, 1975; *Regina vs. Tingskou et al*, Vancouver, 1975; and *Regina vs. Herbert et al*, Vancouver, 1975) have resulted in conviction of the defendants.

The forensic taxonomic debate in *Cannabis* has been decided generally on the grounds of clear evidence indicating that use of the name *C. sativa* was historically, and continues to be, comprehensive of all marihuana plants. This evidence is documented elsewhere [14]. Should taxonomic debates arise for other materials, it would appear that a similar historical analysis of uses of names would point the way to valid resolution of the issue. When armed with sufficient knowledge of the nature of taxonomy, forensic scientists should be reasonably prepared for challenges of their identifications of materials on the basis of semantic manipulations of nomenclature. It is likely that, in historical perspective, the current forensic taxonomic debate concerning *Cannabis* will be viewed as a classic case of semantic chicanery.

Summary

It has been asserted that there are legal species of marihuana plants, and this contention has generated frequent court challenges of criminal prosecutions involving marihuana. Invariably the claim is made that the name *C. sativa* used in legislation is insufficiently comprehensive to proscribe all forms of marihuana. The maneuver being used, alarmingly, is potentially applicable to innumerable other materials, but its success is based on a failure to appreciate the subjective nature of taxonomy and the little-known but critical ambiguities which are inherent in scientific names. The complex principles and operational conventions of biological nomenclature are presented in elementary fashion. Despite important technical constraints on the use of scientific names, some facts are clear: these names are used subjectively, they may be highly ambiguous, the consensus on use of these names is liable to change with time and, most important, quite permissibly they may have substantially different meanings to different users. The claim that there are legal species of *Cannabis* merely amounts to a semantic ploy in which certain of the variants of *Cannabis* that have customarily been understood to be denoted by the species name *C. sativa*, and which are clearly understood to be proscribed, are simply arbitrarily redefined as different species. This ploy has proven unsuccessful in all cases where scientific evidence was adequately presented by the state and in all important court cases where the issue was critically examined.

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