to be named by A," or just "an unnamed species" and without omitting relevant information. If in every instance B must wait for issue of A's publication before completing his own manuscript, work in that field will be appreciably retarded and the advancement of the science impeded. This situation is also not covered by the skimpy appendix on ethics in the Code, but again common courtesy indicates that B should communicate his intention to A and obtain agreement if possible.

The points made by Sohn and the additions suggested here bear not only on nomenclatural confusion but also on assignment of responsibility and on historical accuracy. Both those desirable ends are preserved in my suggestions. It should, however, be kept in mind that the primary aim of the Code and of acceptable nomenclature is the achievement of a clear, universal, and stable system of nomina. The Code is not basically concerned with responsibility or historical accuracy.

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The fact that Professor Simpson and I arrived at diametrically opposed interpretations of authorship in the example given underscores the point that use of "in litt." results in nomenclatural snarls. Because application of the Code to this particular example is peripheral to the points we both made, I shall not discuss the reasons for my use of Articles 9(6) and 50 rather than Article 51(c).

Professor Simpson correctly interpreted my implication that under certain circumstances *nomina nuda* may be justified and desirable. I categorize *nomina nuda* in two classes: legitimate and illegitimate. Legitimate nude names are those used in circumstances described by Simpson. They clarify communication when deliberately introduced and documented by reference which will eventually validate them. Illegitimate *nomina nuda* are the inadvertent offspring of careless writing and poor editing. They confuse communication and should be aborted.

A point hinted at by Professor Simpson is the fact that the Code is in need of additional polishing. Recommendations referred to the International Commission on Zoological Nomenclature at the 16th International Congress of Zoology, Washington, D.C., 1963, were to be ratified or rejected at the next international zoological congress, then scheduled to meet in 1968. No announcement of a 1968 or later meeting of the congress or the commission has been circulated at this writing.

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Notes

1. Publication authorized by the director, U.S. Geological Survey.

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Ethyl Alcohol Consumption: Valid Measurement in Albino Rats

In his paper describing the breeding of rats with a phenotype for alcohol preference, Eriksson (*1*) assumes that the use of a single solution of ethyl alcohol provides an adequate method whereby alcohol preference in the Wistar strain can be evaluated. The procedure based on this assumption makes the validity of the individual measurements of fluid intake questionable and may perhaps undermine the significance of his findings.

Richter and Campbell (*2*) have shown that the amount of alcohol which rats drink in a self-selection situation is directly dependent upon the concentration of the solution offered. As a result of Richter's work, the concept of an alcohol preference threshold has gradually evolved over the years (*3*). By means of a three-bottle method to test an individual rat, a stable and reliable alcohol preference curve can be obtained when drinking bottles are rotated randomly on a daily basis (*4*). We have found that the alcohol preference threshold for several strains, including Wistar and Long-Evans, is usually somewhat lower than 10 percent. In fact, as solutions are increased in strength, total preference for ethanol will often shift to total aversion, usually between 5 and 7 percent (*5*). Most preference functions decline sharply as the selection of ethanol ceases, and no animal drinks the same amount (grams) of absolute ethanol when diluted to concentrations between 5 and 15 percent (*3*).

Eriksson reports that he has found that rats consume the same amount of absolute alcohol when offered the choice between water and solutions of alcohol ranging from 5 to 15 percent, and thus he dismisses the criticism of Fuller (*6*) pertaining to the use of a single concentration of ethanol for determining a phenotype. Furthermore, he writes that Rick and Wilson report the same observation (*7*), but these authors clearly state that "in selection experiments with rats, alcohol concentrations between 2 and 8 percent should be offered when maximum consumption is desired. Except in the case of animals specially bred to consume 10 percent alcohol, it appears inadvisable to offer rats 10 percent alcohol and to attempt to draw conclusions about their behavior, or their metabolism of alcohol, from their voluntary selection. This concentration of alcohol appears to be above the maximum preference level of the Wistar rats used in the present experiment."

To use a single concentration for describing the alcohol preference of an animal is analogous to the pharmacologist's attempt to describe the biological properties of a drug solely by administering one dose of that drug rather than by obtaining a dose-response curve. It is conceivable that if 4 percent alcohol is offered to rats instead of the arbitrary 10 percent solution, all animals would consume large amounts of the fluid; but if the choice were limited to 16 percent alcohol and water, probably none of the Wistar rats would drink the alcohol solution. In any case, measuring the intake of a single concentration of ethanol provides no information about the complex spectrum of factors governing the alcohol selection of individual rats under different experimental conditions.

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27 March 1968

Myers states (*1*) that I assume that a single alcohol solution can be used for determination of the alcohol preference of rats. This is not a mere as-

Table 1. The mean alcohol consumption per unit body weight (milliliters per 100 g) from five alcohol concentrations in drinker and nondrinker rats.

Sex	Rats (No.)	Alcohol solution (%)				
		2.5	5	7.5	10.0	12.5
		Drinkers				
Male	6	0.03 ± 0.02	0.09 ± 0.07	0.16 ± 0.08	0.13 ± 0.04	0.16 ± 0.10
Female	6	.05 ± .02	.15 ± .05	.15 ± .07	.18 ± .03	.13 ± .06
		Nondrinkers				
Male	6	0.05 ± 0.01	0.08 ± 0.02	0.07 ± 0.06	0.06 ± 0.03	0.05 ± 0.01
Female	6	.05 ± .2	.06 ± .03	.11 ± .04	.10 ± .04	.09 ± .03

Table 2. The amount of alcohol solution consumed from five alcohol concentrations as percentages of the total fluid consumption.

Sex	Rats (No.)	Alcohol solution (%)					
		0	2.5	5.0	7.5	10.0	12.5
				Drinkers			
Male	6	5.63 ± 3.9	14.55 ± 11.7	20.97 ± 13.4	25.30 ± 11.1	16.63 ± 6.1	16.93 ± 12.4
Female	6	15.70 ± 11.9	17.15 ± 3.5	25.50 ± 11.7	16.83 ± 5.6	15.78 ± 4.1	9.12 ± 4.7
				Nondrinkers			
Male	6	23.20 ± 11.7	27.65 ± 7.9	23.10 ± 3.3	12.9 ± 13.1	8.17 ± 3.7	5.00 ± 1.3
Female	6	28.40 ± 9.5	22.68 ± 8.9	13.77 ± 5.4	15.53 ± 6.0	11.37 ± 4.9	8.23 ± 3.0

sumption, but a conclusion based upon extensive studies concerned with determination of the phenotype in genetic selection for voluntary alcohol consumption.

Although the concept of alcohol preference which has found general use as a measure of alcohol intake is convenient, and the computations required are simple, I do not find it well suited for determination of the phenotype. The numerical value of alcohol preference is dependent upon the total fluid consumption, which is affected by age and weight; the ambient temperature; the water content of the food; and other secondary circumstances. The consumption of large quantities of alcohol may induce diuresis, and thereby raise the fluid requirement. Animals with the same consumption of alcohol per unit body weight may have preferences which differ greatly. I believe that in comparative physiological studies it is important to calculate the amount of alcohol consumed in relation to the body weight, or the proportion of total calorie intake provided by alcohol, which directly determines the physiological and pharmacological significance of the alcohol consumed. The preference threshold mentioned by Myers has also been found in our animals. Fuller's (*2*) determination of the phenotype on the basis of several concentrations of alcohol is reasonable when preference values form the basis of measurement. Our aim has not been that of developing animals which satisfy their entire fluid requirement by drinking some particular alcohol solution, but of developing strains which drink as much or as little alcohol per unit body weight as possible. Tables 1 and 2 indicate the results of an experiment with our strain of animals, in which water and five alcohol solutions (2.5 to 12.5 percent by volume) were available simultaneously. The position of the tubes was changed randomly every 3rd day, and the duration of the experiment was 4 weeks. Table 1 shows the consumption of alcohol per unit body weight from each alcohol solution; Table 2 gives the proportion of each solution in the total fluid intake. A significant difference is apparent between the groups with respect to their concentration preference (d.f., 1/24; F, 7.62; $P < .005$) (Table 2). The drinker rats preferred 5 and 7.5 percent concentrations; the nondrinkers preferred 0 and 2.5 percent. The sex difference was not significant. This result seems to agree with previous findings (*3*). In the total material, the amount of alcohol consumed per unit body weight varies significantly by reason of the differences in strain and sex, but within the concentration range 7.5 to 12.5 percent or 5.0 to 12.5 percent no significant differences exist between the quantities of the different concentrations consumed. Similar results were obtained when single alcohol solutions of 2.5 to 15 percent, by volume, were offered together with water. The bottle positions were alternated every 3rd day.

In view of our findings, I consider that when the concentration preference of a strain has been determined, use of a single concentration can yield a valid determination of the phenotype. A requirement is that there is a range of concentrations in which the consumption of absolute alcohol remains the same. By use of a concentration which is within this range and exceeds the preference threshold, it is possible to ensure that satisfaction of the fluid requirement does not limit the alcohol consumption.

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