tures thus maintained have been brought to maturity with entire success.

This simple scheme was originally tried in an attempt to reduce the contamination which had been encountered where cotton plugs had been used. It was thought that a lid which would extend far down the sides of the container would put an end to contamination. Since adopting this procedure we have experienced practically no contamination in the shell vials beyond the rare infection introduced at the time of transfer.

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A Regrettable Error

While the editors of *Science* cannot be expected to assume responsibility for the errors made by contributors, it is a sad state of affairs when an article, coming from the physiological laboratory of a leading medical school, shows gross lack of understanding of the basic classification of the Animal Kingdom by elevating the Crustacea to phyletic rank (*Science*, 1946, **104**, 74).

Admittedly, scientific knowledge is becoming so complex that we cannot be expected to have the relatively full knowledge of a field and its related subjects that our grandfathers had, but it does not seem too much to ask that a student in any branch of biological science closely related to zoology should know, at least by name, the major phyla. It would appear from the context of the article that the author believes that there are other arthropods besides barnacles which are important fouling organisms. This is not the case, and such a sweeping reference to "other members of the phylum Crustacea" compounds the original error. Perhaps this does an injustice to the author in question, and the error was simply a *lapsus calami*. Nevertheless, it is an unhappy one.

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Potentiation of the Antibiotic Activity of Aspergillic Acid by Bismuth

It has been reported by the undersigned in a previous article (*J. lab. clin. Med.*, 1945, **30**, 899) that iron interfered with the antibiotic activity of aspergillic acid. It has also been shown that this interference was due to a complex formation between aspergillic acid and iron, the complex being inactive against bacteria.

While investigating the effect of other metals on the antibiotic activity of aspergillic acid, it was found that cobalt, nickel, zinc, arsenic, and bismuth caused a great increase in such activity. Of these, bismuth appeared to be the most effective when high dilutions of the various metals were used.

Bismuth, in a concentration which in itself caused no growth inhibition, decreased considerably the amount of aspergillic acid necessary for inhibiting completely the multiplication of *Staphylococcus aureus*. When human serum was added to the broth, the potentiating effect of bismuth decreased, although it was still demonstrable.

Table 1 represents the effect of bismuth and/or aspergillic acid on a fast-growing strain of *Mycobacterium tuberculosis*, using the cylinder plate method.

TABLE 1

Additions to cylinder	Diameter of circle of inhibition (mm.)
Aspergillic acid, 1 : 10,000	13
Bismuth, 1 : 50,000	0
Aspergillic acid, 1 : 10,000 and bismuth, 1 : 50,000	21

The mechanism of the potentiation of the antibiotic activity of aspergillic acid by bismuth cannot be explained satisfactorily at the present time. However, since bismuth is a sulfhydryl-group destroyer and aspergillic acid binds iron, it is reasonable to assume that certain bacteria are highly susceptible to the simultaneous interference with sulfhydryl groups and iron.

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Disease Control in Frogs

A leprosy-like condition is common in laboratory frogs of the four species, *Rana catesbiana*, *R. clamitans*, *R. palustris*, and *R. pipiens*. A brief description of the condition and means of prevention follows.

The initial external signs are minute ulcers on the toes, usually accompanied by the red spots of redleg. Soon the tissues begin to regress, the soft more rapidly than the hard, until bare bone protrudes. In extreme cases entire feet are lost, but more often death intervenes before more than parts of toes have disappeared. Accompanying the ulceration is a loss of function of afferent but not of efferent nerves. For example, there is no response by decapitated frogs to strong irritants applied to affected limbs, but those same limbs will make the appropriate motions to brush away irritants on unaffected parts of the body.

The disease is readily prevented by keeping the frogs in tap water to which 0.15 per cent NaCl has been added. Growth is normal and health good in this solution when the diet is adequate, e.g. meat, bone meal, and an added source of vitamin D. This diet and the salt solution have reduced deaths from all causes almost to zero. It is good practice to keep all laboratory frogs in the salt solution. We have had only four deaths in two years among hundreds of frogs.

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A Further Note on the Meaning of Normal

Several discussions have recently appeared on the meaning of normal (*Yale J. Biol. Med.*, 1945, **17**, 1493; *What people are.* Cambridge, Mass.: Harvard Univ. Press, 1945; *Science*, 1946, **104**, 87). All of these discussions

seem to have missed a rather important implication of the word "normal." Attention was called to this in a short, recently published note on physiological standards (*Fed. Proc.*, 1946, 5, 61). It is too often the custom to refer tritely to physiological standards as "normal." This suggests presumptuous connotation of what ought to be. Such standards are merely averages or means of various observations on different, presumably healthy organisms. To refer to such averages as "normals" causes semantic and practical confusion. Physiological averages or means are scientifically descriptive. We are as yet in no position to attempt to agree on what physiological standards ought to be. Such an attempt, involving possible purposes, may be an ethical proposition, for which scientific descriptive data are necessary, but merely as one factor to be considered. Physiological standards may be established by appropriately scientific and descriptive methods. The normative approach to such standards is not yet appropriate.

It is important for scientists to remember that "normal" has a technical significance in ethics. It implies generally what "ought to be." This meaning is generally associated with the term, resulting in practical difficulties when scientists use the word "normal" to refer to a descriptive average. It is as important for scientists to be as precise in terminology as in measurement.

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Iron Concentrations in Cholinesterase Preparations

It is desired to call attention to the presence of iron in some cholinesterase preparations. Those who have available such preparations may wish to examine them for contained iron in order to reach a conclusion as to whether the metal is a contaminant or an intrinsic part of the enzyme.

On pharmacodynamic grounds it was postulated that cholinesterase was a heme compound (*Proc. Soc. exp. Biol. Med.*, 1943, 54, 254). The arguments advanced for the heme nature of this enzyme would hold as well for the presence of a prosthetic nucleus containing any one of the transitional metal elements. The crucial argument is the marked antiesterase effect of fluoride ion which forms (usually) undissociated polar compounds with such elements.

Interest attaches, therefore, to the fact that crude cholinesterase preparations from three different sources have been found to contain iron in concentrations concomitant, if not proportional, to their esterase activity. A sample of electric eel material obtained from Dr. Howard M. Fitch, of New York University, 1 mg. of which hydrolyzed 1,200 mg. of acetylcholine per hour, had an iron content of 47.3 mg. per cent; a serum esterase preparation furnished by Dr. John H. Northrop, of the Rockefeller Institute for Medical Research, which split 20 mg. of acetylcholine per mg./hr., had 19.8 mg. per cent of iron; while a human erythrocyte cholinesterase prepared here, with an esterase activity of 7.8 mg. per mg./hr., had an iron content of 9.0 mg. per cent.

The iron contents of these esterase preparations are higher than have been found in esterase-free crude globulin concentrates, and this suggests that the iron either is concentrated along with the esterase fractions or comprises an actual component of the latter.

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Hypoparatypes

There has long been a general need for a recognized category for the "less typical" specimens which authors frequently use in arriving at their concept of a new species. Not infrequently certain specimens, although available to authors at the time of or prior to their proposal of species names, for various reasons are of such a nature that they cannot appropriately be named paratypes, with the implication that the latter name carries of being wholly adequate for subsequent comparisons by the same or other authorities. They are satisfactory neither as holotypes nor as paratypes; and at the present time these are practically the only terms in general use for the original series, at least in the field of vertebrate taxonomy. Yet it is only fair to the readers for whom the accounts are intended that all material be recorded. With recognition of an additional category, immature, injured, incomplete, or specially treated specimens might be listed without incurring the liability of their interpretation by others as "paratypic" material (in the above sense).

Accordingly, it is suggested herewith that specimens not wholly representative be regarded and listed as *hypoparatypes*. This term is defined as a category for specimens upon which an author originally bases his concept of the species newly named, but which are neither the single, select specimen (holotype) nor the other specially designated specimens (paratypes) serving as his chosen representatives of the presumed species.

The term suggested is a modification of *hypotype*, which might well be construed to have the same meaning as that proposed for hypoparatype. The former word has generally been applied, however, to subsequent, not concurrent, supplementary material; its use varies so considerably that substitution for hypoparatype would clearly court misunderstanding. No other term has been proposed, so far as I am aware, with the desired meaning.

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Rigid Thinking in the Social Sciences—A Vital Need

G. F. Hull has given us a most enlightening review of the development of physics in the United States (*Science*, 1946, 104, 238). However, his sociological observations are hardly in line with the general excellence of his presentation.

"The scientists of this Nation," he asserts, "are not likely to make war on this or any other nation." It goes