The relationship between the council and the unions will be greatly eased by the following resolution adopted by the General Assembly:

The General Assembly is favorably disposed to the freedom of the unions to alter their own statutes within the limits assigned by the statutes of the International Research Council and hereby empowers its executive committee to exercise the powers of approval conferred upon the council in Statute 5.

Statute 5 reads:

The statutes of the unions formed by the International Research Council require the approval of this council.

The above resolution not only assures sympathetic consideration of the desires of the unions on the part of council, but also makes possible action by the executive committee in the long intervals, usually three years, between the meetings of the General Assembly.

The delegates from the United States were Dr. Moore, of Purdue University, and Dr. St. John, of Mount Wilson Observatory.

CHARLES E. ST. JOHN

VITAMIN B TERMINOLOGY

IN November, 1927, Dr. E. V. McCollum, president of the American Society of Biological Chemists, received the following communication from the British Committee on Accessory Food factors:

Dear Sir:

At a meeting of the Accessory Food Factors Committee (appointed jointly by the Lister Institute and the Medical Research Council, 1918) and others interested in vitamin research in this country,[1] which was held on November 14, 1927, at the Lister Institute, under the chairmanship of Sir Frederick Gowland Hopkins, a discussion took place upon the nomenclature of vitamin B and its recently defined constituent parts.

The committee feel strongly that those workers in this field of research, should, if possible, arrive at some provisional general agreement regarding this point, so that references in the literature emanating from different schools may be uniform and unnecessary complications may be avoided.

The following suggestions were unanimously supported by those present: (1) That pending further investigation, much confusion will be prevented if the designation vitamin B, first used by McCollum and Davis and now firmly established in the literature, should be retained for all dietary factors belonging to this group of water-soluble vitamins. (2) That the term vitamin B_1 should be adopted for the antineuritic (more heat-labile) water-soluble dietary factor which was first discovered by Eykman in 1897 and is required to prevent polyneuritis in birds and marasmus with, or without, paralysis in mammals and beriberi in man. (3) That the term vitamin B_2 should be adopted for the more heat-stable, water-soluble dietary factor, recently described and named P–P ("pellagra-preventive") factor by Goldberger, Wheeler and Lillie and Rogers (1926) and found necessary for maintenance of growth and health and prevention of characteristic skin lesion in rats, and considered by the latter workers to be concerned in the prevention of human pellagra.

Such a scheme as the above possesses the advantage that place could conveniently be found to include any other constituents of this group which might be discovered subsequently.

The committee was of the opinion that the term "Bios" should be retained to denote the factor or factors encouraging rapid growth of yeast cells.

The committee have instructed me to forward the above suggestions to the American Society of Biological Chemists in the hope that they may be brought to the notice of its members and may invite their comments and criticism. It is held that all will agree upon the necessity of reaching agreement upon this point.

A copy of this letter has, at the same time, been forwarded to the British Biochemical Society and to some of the principal workers in this field of research on the continent and in the United States of America.

I am, yours faithfully,

(Signed) HARRIETTE CHICK,
Secretary

In response to this communication President McCollum appointed (in December, 1927) a Committee on Vitamin B Nomenclature to report at the April meeting of the American Society of Biological Chemists. This committee consisted of H. C. Sherman (Columbia University), Atherton Seidell (Hygienic Laboratory, Washington, D. C.), P. A. Levene (Rockefeller Institute for Medical Research), Harry Steenbock (University of Wisconsin) and R. Adams Dutcher (Pennsylvania State College).

Opinions of several interested workers, in addition to the members of the committee, were sought and letters were received from others. A total of fifteen workers have written the committee expressing their views. In many cases the opinions expressed represented the opinions of from one to eight coworkers.

The opinions expressed by the various groups of American workers were far from unanimous, the majority voting unfavorably on the suggestions of the British committee, except for the suggestion regarding the retention of the term "Bios." No letters have been received expressing opposition to this suggestion. Analysis of all suggestions submitted indicates that American workers favor three different

[1] Sir Frederick G. Hopkins, F.R.S., *chairman;* Professor J. C. Drummond; Professor A. Harden, F.R.S.; Sir Charles Martin, F.R.S.; Professor E. Mellanby, F.R.S.; Professor R. H. A. Plimmer; Professor R. A. Peters; Dr. Harriette Chick, *secretary.*

systems of nomenclature for the components of the vitamin B complex.

In brief the three systems of terminology suggested may be described as follows:

(1) *The British suggestions:* This terminology would use the letter B to designate the complex, B_1 to identify the heat-labile factor, and B_2 to refer to the heat-stable factor or factors which have to do with appetite and growth stimulation, amelioration of skin affections, etc.

(2) *The Sherman suggestions:* Dr. Sherman suggests the term F to designate the heat-labile factor and G to identify the heat-stable fraction.

(3) *The McCollum suggestions:* Dr. McCollum suggests that the term B be restricted to refer to the heat-labile factor, since it was the first one studied, and to create new letter designations for subsequent components of the complex as fast as they are recognized as separate entities. He suggests the letter F (or G) for the heat-stable factor. Other suggestions were made, but since they were not supported by many workers, reference to them will be omitted.

It is impossible to do more than summarize the arguments of the proponents of the various systems of nomenclature. The letter from the British committee, quoted above, will give the reader the reasons for their suggestions.

On January 10, 1928, Dr. Sherman wrote the following letter in explanation of his suggestions:

(1) I concur in the recommendation of the British Committee that the term "Bios" be retained as stated.

(2) I concur in the implied recommendation of the British Committee that no one substance should hereafter be designated by the unqualified term "Vitamin B."

(3) For the two now recognized substances formerly covered by the term vitamin B, I think that the designations "Vitamin F and G," proposed somewhat over a year ago in the *Journal of Chemical Education* and also last summer in the *Journal of Biological Chemistry*, are much preferable to the designation B_1 and B_2 proposed by the British Committee.

To discuss all the advantages which, in my judgment, are possessed by the designations F and G over B_1 and B_2 would make this letter too long. A few of them are as follows:

(a) *Consistency with the accepted plan of designation* of the vitamins by letters, according to which each substance of this group, when its existence has been sufficiently demonstrated, receives as designation a separate capital letter, assigned in alphabetical sequence as the need for each becomes clear. The designations F and G are entirely consistent with this established and accepted plan, while the designations B_1 and B_2 are not consistent with it, since they use the same letter for different substances.

(b) *Definite freedom from unwarranted implications* in the case of the designations F and G, whereas the designations B_1 and B_2 imply (would certainly suggest to many if not most readers) that these two substances are more closely related to each other than are any other two substances of the vitamin group (vitamins A and D, for example), an implication which may or may not prove true but for which there is I think no adequate evidence at the present time.

(c) *Very great advantage in presentation* to students and to the public. The reason for having new designations is that we are satisfied that the two factors are separate substances. This is clearly indicated by the use of the terms F and G, whereas the use of the terms B_1 and B_2 might easily lead to the supposition that they are merely two forms or phases of the same substance. Designations involving subscripts are awkward to speak, to typewrite or to print. The frequency with which we see ultra-violet rays referred to as "violet rays" in the newspapers should warn us that in practice the subscripts would often be slighted and either B_1 or B_2 would be liable to appear as "vitamin B" in a newspaper or other popular presentation (as well as in students' notes). And still greater would be the confusion if we should later have a B_3 and perhaps a B_4, whereas if we adhere to the plan originated by McCollum, developed by Drummond, and uniformly followed hitherto, *viz.*, that of giving *each recognized vitamin a separate capital letter,* there should be little danger of confusion either in technical or non-technical discussions.

In a recent letter, Dr. Sherman expresses the opinion that he is not interested in retaining the term B to denote the complex. In fact he feels that nothing would be lost if the term B should be given "honorable retirement," leaving this space blank in the system of vitamin nomenclature.

Sybil L. Smith has already advanced arguments for Dr. Sherman's suggested system of terminology.[2]

The following letter of Dr. McCollum, written on February 24, advances arguments in support of a third method of terminology:

(1) Each vitamin principle essential to the rat should be recognized as a separate entity; each should receive a separate name. There should be no attempt at grouping them into an artificial complex, that is, subordinating them to a generic name. The substances should be treated as individual factors of equal rank.

(2) Provision for vitamins which may be discovered in the future but which are at present unknown.

The terminologies proposed by Goldberger, Salmon and Chick and Roscoe are open to criticism because they violate the first criterion. They take the unnecessary, indeed, misleading step of supplying the complex with a

[2] SCIENCE, lxvii, No. 1741, 494, May 11, 1928.

name, implying a subordinate rôle for each factor of the complex. The recommendations of the Accessory Factor Committee show even more subordination of the independent substances not only in assigning a generic name to their artificial complex, but also in giving subnumerals to the constituent factors. In addition, the numerals possess no advantage over the generally accepted system of letters. The same criticisms may be levelled against figures as against letters, but usage has made adherence strictly to letters very desirable.

The system that meets the criteria most exactly is Drummond's modification of McCollum's original plan. This deals with each vitamin as an entity; there is no grouping or subordination. Further, it provides for additional members as rapidly as they are recognized.

We have seen that at present only two factors, the thermo-labile antineuritic principle, and the thermostable anti-pellagrous principle need identification. Adhering to the McCollum-Drummond plan involves a new use for the term vitamin B as a definite factor, else it becomes a blank in the scheme. It can not be used in its old sense.

It is proposed that:

(1) The term vitamin B be adopted for the antineuritic (more heat-labile) water-soluble dietary factor which was first discovered by Eykman in 1897 and is required to prevent polyneuritis in birds and marasmas, with or without paralysis, in mammals, and beri-beri in man.

(Vitamin B even in its older sense has been generally regarded as thermo-labile, and the antineuritic effect has long been associated with this term. For these reasons the thermo-labile antineuritic principle rightfully merits the priority to the term vitamin B. In this proposed scheme vitamin B has merely a more restricted meaning than formerly.)

(2) The term vitamin F (or G) should be adopted for the more heat-stable water-soluble dietary factor described and named by Goldberger, Wheeler, and Lillie and Rogers as factor P–P, and found necessary for maintenance of growth and health and prevention of characteristic skin lesions in rats, and considered by the latter workers to be concerned in the prevention of human pellagra.

(This factor was discovered as an independent principle by Goldberger, *et al.*, and should be treated as a separate vitamin, taking the next available letter in the alphabet, namely F (or G).)

(3) No generic name shall be given to all dietary factors belonging to this group of water-soluble vitamins, since it is not only unnecessary but also misleading. In fact, mention of "complex" should be abandoned.

(Vitamins B and F (or G) are independent factors on equal rank with all other vitamins, and need no collective term.)

(4) Recognition of existence of additional water-soluble vitamins in the future shall be met by taking the next available letter in the alphabet, following the usual prefix vitamin.

(5) Bios shall be retained to designate the factor or factors encouraging rapid growth of yeast cells.

Under date of February 6, 1928, Dr. Steenbock advanced the following reasons for his preference:

Previous to the organization of the committee, I was in receipt of the report of the British Accessory Food Factors Committee to which my reaction was very unfavorable. To include the heat-labile and the heat-stable factors, and possibly others, under vitamin B differentiated by subscript suggested to me a common parentage or at least a greater relationship between them than appears justifiable on the basis of present knowledge. If the precedent of such a system were once established for any one vitamin, then it would soon be used for others. For instance, I see no reason why it would not be quite justifiable to use such a system in connection with vitamin A and the antirachitic factor.

When I read Dr. Sherman's suggestions in the *Journal of Chemical Education* that the term vitamin B should be used for the B *complex* and that heat-labile and heat-stable factors should be designated respectively vitamin F and G, my reaction was again unfavorable. In the first place, I see no reason why a vitamin complex of variable quantitative composition should be designated by a letter and, in the second place, I see no reason why the heat-labile antineuritic factor should not be accepted as vitamin B. If historical back-ground counts for anything, it may be recalled that it was McCollum's belief that his water-soluble vitamin B was identical with Eykman's antineuritic principle. Why not continue the use of the term vitamin B in this sense irrespective of its relationship to growth and then use the letter F (or G) for the designation of the heat-stable P. P. factor of Goldberger.

I quite agree with the opinion expressed by the British Accessory Food Factors Committee that it is advisable that the term Bios be retained. In fact I see no reason why other names of suitable designation should not be used by various investigators in their own field of investigation until accumulated evidence warrants the inclusion of the newly discovered factor among the vitamins needed by the animal. It seems to me that it would be expecting too much to have all substances of the nature of vitamins which are indispensable for different types of life to be immediately included in the alphabetical system of nomenclature. When it is found that such substances are indispensable for animals their final inclusion in this system could then be decided upon by a committee on vitamin nomenclature reporting in this country to the Federation of American Societies for Experimental Biology.

From the above you can see that my ideas are quite reactionary to contemplated changes. In fact I am quite convinced that such confusion as threatens us is due not to inavailability of a proper system of nomenclature, but to a paucity of experimental facts and to a certain hastiness in naming. The former will ultimately correct itself, the latter can be corrected by delegation.

Many workers merely wrote that they favored one system or another, without detailed reasons for their opinions. Dr. Sybil Smith's letter in support of the Sherman suggestions has already been published, in substance, and will not be included here.

Nutrition workers will also be interested in the following quotation from Dr. H. H. Mitchell's letter of April 10, 1928.

There is no question but that the situation with respect to the nomenclature of the components of vitamin B is confusing. The use of the letter B has been so generally applied to what was thought to be a definite dietary factor with growth-promoting and antineuritic properties, that its entire elimination from the list of vitamin letters seems advisable to me. Even its use to denote the combination of the two or more water-soluble components, as has been suggested, seems objectionable to me, since it would refer to no definite combination of dietary factors and hence would have no definite significance. I can not conceive of any situation requiring the use of such a loose term.

The A and D situation was not analogous to the B situation, since, in this country at least, vitamin A was not at all generally confused with the antirachitic factor, so that the discovery of this factor, although possibly vitiating some of the work done on vitamin A, did not modify the meaning generally attached to this term.

I favor the use of new letters to designate the components of vitamin B, but I feel that there is danger of making the same sort of an error in defining vitamins F and G as was made in defining B, with the same unfortunate confusion of ideas and the same misdirected experimentation. There is such a general feeling of satisfaction in the establishment of the identity of two factors in any scientific problem, because its ultimate solution is to that extent simplified, that the pronouncement of such an identity is frequently not subjected to the critical scrutiny that its importance deserves. In the present case, there is nothing to be gained, and the possibility of considerable confusion is incurred, by identifying vitamin F (investigated in rat-feeding experiments) with the antineuritic vitamin and, particularly, vitamin G with the antipellagra vitamin, if such there is, until the evidence of these identities is established beyond a reasonable doubt. I think Sherman's statements on this matter are premature.

To my way of thinking it is time, in these days when pronouncements of new dietary factors are becoming so frequent, to come to some general agreement concerning the proper criterion for the demonstration of a new vitamin. Surely the statement that a new vitamin exists should be something more than the mere expression of one's inability to explain experimental findings on any other basis. The factor should be obtained in a potent and concentrated form, the addition of which in minute amounts to a ration, preferably synthetic in character but in all cases demonstrably complete in all other known respects, will *invariably* induce a marked betterment in the nutritive condition of properly prepared experimental animals, an effect which is not dependent upon an increased intake of food. Some such criterion should be satisfied, preferably by more than one investigator working independently, before a letter in the vitamin series is assigned to a new dietary factor. Conservatism in such matters is the wisest policy to pursue.

It would appear that a majority of workers, who have indicated a preference, are quite agreed (in the light of Dr. Herbert Evans' introduction of vitamin F) on the use of the term "G," to denote the heat-stable factor. Some difference exists, however, relative to the term which should be used to designate the heat-labile antineuritic factor.

The committee is not ready to make its final report and it will welcome suggestions from all interested workers in the vitamin field. Steps are now being taken to cooperate with other scientific groups before making definite recommendations.

The members of the committee feel that the naming (by other than descriptive terms) of newly discovered food factors should be discouraged until a system of terminology has been agreed upon. Many workers have expressed themselves as being in favor of discouraging the designation of new vitamins until their identity has been established beyond question. In this the committee is in accord.

Suggestions have been made that an American committee be appointed, representing the interested scientific societies, which may act as a clearing house for questions in vitamin terminology and perhaps cooperate with similar foreign committees in actually naming new factors. This suggestion is made with the hope that it will avoid confusion in the literature and promote uniformity, which is highly desirable.

R. ADAMS DUTCHER, *Chairman*,
Committee on Vitamin B Nomenclature, American Society of Biological Chemists, Pennsylvania State College.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

ELECTRICAL APPARATUS FOR THE ACCURATE GENERATION AND MEASUREMENT OF NOISE AND TONE

THE scientific study of noise is becoming of increasing importance in recent years due to recognition of its possible harm and wastefulness. Since preliminary tests seem to indicate that different pitches vary considerably in their annoying properties, the apparatus used must be accurate and reliable with respect to pitch, maintaining it over long periods of time, and furnishing it at will. Intensity must be accurately controlled and must be reproducible at any time.