band, Walter Rathbone Bacon, for the study of the fauna of countries other than the United States. The amount available is the interest on the capital invested (about $3,000 a year), the incumbent to hold the scholarship not less than two years. Applications for this scholarship, addressed to the secretary of the Smithsonian Institution, should be submitted not later than March 15. The application should contain a detailed plan for the proposed study, including a statement as to the faunal problems involved; the reasons why it should be undertaken; the benefits that are expected to accrue; the length of time considered necessary for the carrying out of the project; the estimated cost, and the scientific and physical qualifications of the applicant to undertake the project.

THE Council of Child Neurology Research announces that applications for grants will be considered at the meetings to be held in April and October of each year. The purpose of the council is to encourage original research on the definite problems coming within the scope of child neurology and allied fields. Applications must be in the hands of the director, Dr. Bernard Sachs, 116 West 59th Street, New York City, before April 1 and September 15. The applicant must state distinctly the problem under investigation and the methods to be pursued.

THE Committee of the House of Representatives on Coinage, Weights and Measures has reported a bill which would fix the length of the inch and weight of the pound. The bill proposes to establish the inch at exactly 25.4 millimeters. This would shorten it by two millionths of an inch. It is now 25.40005 millimeters, as against 25.39996 in Great Britain. Dr. Lyman J. Briggs, director of the Bureau of Standards, spoke before the committee in support of the bill.

DISCUSSION

THAT WORD "EMULSOID"

SHAKESPEARE wrote, "What's in a name?"; but then, he had never heard of "emulsoids." No word has caused more confusion in the colloid-chemical thinking of physiologists than "emulsoid." Biologists continue to take it at its etymological value, while most chemists have long ceased to regard it in this, its original sense. The term was coined by Wolfgang Ostwald in the early years of the present century, when colloid chemistry was still in its infancy, as sciences go. Originally "emulsoids" included coagula, jellies and emulsions, the term being based on the assumption that jellies are fine emulsions. Ostwald's only evidence for assuming that jellies are "emulsion-like" was that both they and emulsions increase in viscosity with increase in concentration of the dispersed phase, while "suspensoids," or solid colloidal suspensions, do not do so. The evidence on which the term was based is correct, but it tells a very small part of the whole story and is entirely misleading. To this day, the concept that jellies are fine emulsions clings, in spite of repeated and substantial proof to the contrary.

My own interest in this matter rests on the mischievous influence of the word "emulsoid" on interpretations of protoplasmic structure. All agree that protoplasm is an "emulsoid," but those biologists who know of the word only from the reading of old and standard texts conclude that protoplasm must be a liquid-liquid system, for that is what the word "emulsoid" means, *i.e.*, "emulsion-like," and emulsions are liquid-liquid systems. Other workers, knowing the historical background of colloid chemistry, realize that the word "emulsoid" has long since lost its original meaning, for no chemist well grounded in his knowledge of the colloidal state believes jellies to be like emulsions, except in that one property which Ostwald selected for the basis of his classification. In every other respect, dispersions of gel-forming substances are quite distinct from emulsions. Whatever their structure, jellies are not liquid-liquid systems.

Though there are some interesting experiments which indicate that protoplasm behaves like an emulsion, many physiologists regard the similarity as purely incidental and superficial. The emulsion hypothesis of protoplasmic structure satisfies but few conditions, and is wholly contrary to many of the most significant properties of living matter. Among speculations on the emulsion nature of protoplasm, there is one that has recently come to my attention, namely, that the human brain is an emulsion; not only this, but it is said to reverse from oil-in-water to water-in-oil. While I know little about the histology of the brain, I am convinced that the hypothesis is based on the keen sense of humor of its author, for a brain that is an emulsion of water dispersed in a continuous phase of oil is a brain through which little can penetrate. Perhaps the author of the theory has some colleague in mind!—The brain consists of cells, or so-called cell-bodies, with their fibrous axons and dendrites, interwoven by a supporting framework of neuroglia, the whole bathed in fluid: this is not an emulsion.

It is not, however, my purpose here to discuss the "emulsoid" hypothesis of protoplasmic structure, but rather to plead with physiologists to give up ideas on gel structure which most chemists have long since discarded.

The controversy is an old one, but I had rather assumed that it was amicably settled, yet on reviewing of late a number of text-books on physiology and chemistry, the persistence of the theory was brought to my attention in a striking way. A note, therefore, seems worthwhile.

None of us treads with security when wandering far from our chosen field of research, as every physiologist must if he covers his subject in a broad way, but an author may save himself and his readers from old and discarded ideas by simply turning to an authoritative source. In the present instance, the colloid chemist is the man to whom physiologists must turn. An outstanding authority such as Freundlich[1] says that the word "emulsoid" must either be dropped or its original and etymological meaning ignored.

Selections from five new books, four in physiology and one in chemistry, illustrate how poorly biologists and some others have heeded this advice of Freundlich.

In one text, emulsoids are defined as liquid-liquid systems, and milk cited as an example. On the next page, the author states that in addition to "these various types of colloidal suspensions, mention should be made of emulsions," which he again defines as liquid-liquid systems with milk as an example. What is the student to make out of this, for not only is an emulsoid given the twenty-five-year-old and discarded definition of Ostwald, but the author tells the student that *another* type of system will now be considered, namely, emulsions, and then gives the same definition and the same example already stated for emulsoids.

In the second text, "colloidal theories" are introduced by a reference to "emulsoids," then, without any break in thought, the emulsion hypothesis of cell permeability is presented.

Two other text-books publish the diagrams first used by Bayliss and intended to illustrate a hydrosol and a hydrogel. The first figure is of black spots on a white background and labelled "hydrosol"; the second is of white spots on a black background and labelled "hydrogel." These are typical diagrams of an oil-in-water and a water-in-oil emulsion.

Bayliss refers to the scattered black spots of the "hydrosol" and the black background of the "hydrogel" as solid matter and thus regards the hydrogel of gelatine as similar to that of silica. This is in keeping with the micellar theory of gel structure which Bachmann thought he had shown to be true for gelatine. The error of Bayliss lay not so much in supporting the micellar hypothesis of gel structure but in assuming that water is firmly held in a jelly because it is "imprisoned" between "solid walls."

1 "Capillary Chemistry," 1926.

Water is firmly retained in jellies not because it is trapped in pockets or in isolated drops, but because it is bound by adsorptive or other forces.

Those who have copied the black and white diagram of Bayliss misinterpret the situation still more by referring to jellies as fine emulsions and to the setting of gelatine as involving phase-reversal. The figure is labelled "a diagram to illustrate the reversal of phases during sol-gel transformation." With this statement the assumption is again made that "enormous pressure is required to squeeze water out of a set hydrogel," because "the previously continuous phase—becomes the dispersed phase."

The author of a recent book on the colloidal state of matter asserts that liquid-in-liquid systems *include* the "emulsoids," and these in turn "contain the emulsions." The author realizes that emulsions are not good "emulsoids" and suggests that they be put in a separate group, but he gives as reasons that many emulsions are outside of the colloidal range because of the size of the dispersed drops, and many are not simple two-phase systems; all of which is true, but these are not the reasons why emulsions are not "emulsoids," as the term is now generally used.

The structure of jellies is not known with certainty, though much progress on this subject has been made in the past quarter of a century. At the first Colloid Symposium (in 1923) a preliminary (and as yet unpublished) report on the structure of gelatine was given. The speaker referred to the gelatine molecule as a fiber of great but definite length, with a cross-section of not more than a few Ångstrom units. It is only necessary to postulate an interweaving or other specific grouping of these molecular fibers to obtain the type of structure now very generally applied to jellies and to protoplasm.

Whether the fibrillar (chain molecule) or micellar theory of gel structure is the correct one is unimportant so far as the point under discussion is concerned. Here we are concerned only with the generally held point of view that jellies are not fine emulsions and gelatinization does not consist in a reversal of phases.

Ellis[2] and Donnan stated in 1913 that neutral oil emulsions are model *suspension* colloids; that is to say, they are "suspensoids," and not "emulsoids." Four years later, Hatschek,[3] on the basis of a neat mathematical-physical analysis, asserted that "the theory that gels consist of two liquid phases must be pronounced untenable." McBain[4] has since found that there is no change in the electrical conductivity of a soap sol when it sets to a gel, which means that the continuous and conducting phase remains the same;

2 Transactions of the Faraday Society, 9: 14, 1913.
3 Transactions of the Faraday Society, 12: 17, 1917.
4 *Jour. Phys. Chem.*, 28: 706, 1924.

there is, therefore, no reversal of phases. The work of the x-ray investigators, Sponsler,[5] Astbury,[6] *et al.*, should be sufficient to convince one that gels and jellies are not emulsions.

Much confusion and erroneous instruction will be avoided if the word "emulsoid" is discarded. It was based on a misconception and is no longer used by well-informed chemists in its original sense.

So with Lady Macbeth, I cry, "Out, damned *emulsoidal* spot! out, I say!"

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THE EFFECT OF SPECTRAL REGIONS ON THE CHLOROPHYLL "A" TO "B" RATIO

IN an investigation of the photochemical responses of the wheat plant to spectral regions, Lease and Tottingham[1] found the chlorophyll content to be affected. This effect was in the direction of increased chlorophyll content and greener tissues when the blue-violet was added to the red-yellow region of the spectrum. The implications of these results and the related investigations of Guthrie[2] concerning the chlorophyll "a" to "b" ratio have been followed and somewhat confirmed. Substituting for their colorimetric methods, a spectrophotometric method, a small but consistent lowering of the proportion of chlorophyll "a" to "b" has been found in wheat plants grown under a filter which absorbs the blue end of the spectrum. In agreement with work of other investigators, the absorption curves of the pure components, isolated by the procedure of Zscheile,[3] show that the ratio of the absorption coefficients of chlorophyll "a" to "b" is higher in the red than in the blue region of the spectrum. It is to be expected that the higher activation of chlorophyll "a" in red light would lead to a lowering of the "a" to "b" ratio. Apparently the almost universal proportion of three to one in normal green plants may be dependent upon the relatively constant quality of sunlight.

The lowering of the "a" to "b" ratio is increased (if it is assumed that the absorption spectrum of a chlorophyll is a sufficient criterion of its presence and amount) by irradiating with monochromatic light of such wave-length as will be largely absorbed by chlorophyll "a". Subsequent comparison of the absorption curve of an acetone extract of the irradiated leaves with that of an unirradiated sample shows an increase in maxima corresponding to chlorophyll "b" and an attendant decrease in chlorophyll "a" maxima, in both the red and blue regions. The presence of carotenoids in this extract was found to offer no significant interference. In so far as the absorption curve may be considered indicative, there is no change in total chlorophyll. An attempt is now being made to determine if the process may be reversed and chlorophyll "b," or substances absorbing in that region, be reduced to chlorophyll "a" through selective activation with monochromatic light.

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5 *Jour. Gen. Physiol.*, 9: 221, 1925.
6 "Fundamentals of Fibre Structure," Oxford, 1933.
1 E. J. Lease and W. E. Tottingham, *Jour. Am. Chem. Soc.*, 57: 2613, 1935.
2 John D. Guthrie, *Am. Jour. Bot.*, 16: 716, 1929.
3 Paul F. Zscheile, *Bot. Gaz.*, 95: 529, 1934.

THE "DANA" AND THE "RESEARCH"

IN an article under the heading "The Danish Nonmagnetic Research Ship," in SCIENCE (January 21, 1938, pp. 59–60) there was some confusion regarding the Danish vessel *Dana* and the *Research* of the British Admiralty. It is felt this matter should be set right in order that mistaken impressions may not persist.

The Danish Meteorological Institute advises that the *Dana* is an iron vessel, recently constructed in Denmark for oceanographical and fishery researches; it is unsuitable for magnetic observations at sea.

The *Research*, on the other hand—now under construction—is a non-magnetic vessel especially designed for magnetic observations at sea to continue the oceanic work of the *Carnegie* which was so unfortunately lost in 1929 at Apia, Western Samoa. The need of such a vessel is clear from a consideration of the lacunae in the magnetic data required for the construction of magnetic charts. These gaps would have been filled had the *Carnegie* completed her last cruise, but, taken in connection with the recent rapid changes in secular variation and shifts of isoporic foci—notably in the Indian Ocean—they make for considerable uncertainty and possibly serious errors in extrapolated values of the magnetic elements over large areas.

The Carnegie Institution of Washington cooperated with the British Admiralty in the design and equipment of the *Research* by supplying plans, specifications and descriptions of the *Carnegie* and of her equipment. W. J. Peters, the first commander of the *Carnegie* and designer of many of the special instruments required for increased precision of observations at sea, spent a year in England as a consultant to the Admiralty on the construction and instrumental outfit of the *Research*.

J. A. FLEMING

THE IDENTIFICATION OF VITAMIN C

PRIORITY questions are not of primary importance to science and should be left to posteriority. If, however, such problems are discussed it is desirable that statements made should be correct and complete.

The chronological list of events given by G. C. Cox[1]

1 SCIENCE, December 10, 1937, p. 540.