combined by multiplication, volume 1, part 2 (1932), page 43. Similar statements appear in many other places. Some writers have employed the term semi-group for such a set of elements, but it is questionable whether it is desirable to establish a neutral zone between the elements which constitute a group with respect to a given definite operation and those which do not have this property. A much wider neutral zone than that suggested by the term semi-group has been advocated by various recent writers who employed the expression a set of elements having "the group property" whenever these elements satisfy the condition that every two of them can be combined and that the result of this combination is an element of the set. Nothing seems to have been gained thus far by the efforts to establish a kind of neutral zone between groups and non-groups. In fact, the difficulties have been only increased thereby since the number of the boundaries to be observed has thus been enlarged with too much vagueness as regards the territory outside the definite group area.

A set of elements which have "the group property" as explained in the preceding paragraph is explicitly defined as a group in volume 2, page 243, of the second encyclopedia noted above. In view of the eminence of this authority it seems almost futile to register here an objection to this use of the technical term group. It is, however, obvious that in the present state of mathematical knowledge it is impossible to develop an extensive theory as regards such a general concept. Few, if any, of the body of more than five hundred theorems which have been developed under the heading of group theory apply to such a general conception of the technical term group. Notwithstanding the diversity of definitions to which we have referred it should be emphasized that the theory of groups involving a finite number of elements has encountered few difficulties as a result of differences in definitions since this theory has always been based on known properties of permutation groups involving a finite number of letters. One of the simplest and most useful definitions of the technical term group, which applies to all groups, is as follows: A set of distinct elements obeying the associative law when they are combined constitutes a group provided it satisfies the condition that if two of the symbols of the equation $xy=z$ are replaced by the same or by different elements of the set the resulting equation has one and only one solution therein.

If such an elementary definition of the technical term group would be universally adopted it would greatly simplify the literature relating to this subject. On the other hand, it is clear that progress is more important than simplicity whenever these can not be combined. As long as experimenting with other definitions seems to lead to important results such experimentation should be encouraged. The source of the definitions of the technical term abstract group is the use of the term group in regard to concrete elements which obey laws that were not explicitly formulated at the time. The earliest definitions were therefore much simpler than those which aimed to embody these laws and to serve as a foundation of an abstract theory of the subject. Naturally the older definitions were often adopted later, especially by those who made only infrequent use of the subject and failed to familiarize themselves with the more recent advances. Mathematicians are a heterogeneous class of people whose achievements are due to different types of abilities, and who sometimes capitalize their success in certain directions to speak on subjects which they have not mastered. These facts may help to explain the confusion which now exists in the literature as regards the definition of the technical term group and which the present note aims to alleviate.

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A NAME FOR BIO-HYDRAULIC ACTIVITIES

THE volume of literature concerning water and solutions in living tissues is constantly growing, and many investigators are becoming increasingly interested in the amount, state and relatively constant ratio of water and dissolved salts concerned in biological structures and life processes.

Without doubt, most of us would be glad to find a suitable and all-inclusive term to designate the recognized group of phenomena related to the regulation of water and mineral salts (solutes in general, perhaps) in living protoplasm. Those of us who are interested particularly in marine and other aquatic organisms and their maintenance of equilibrium against media of different osmotic value are perhaps more directly concerned, though certainly not necessarily so.

Let us consider such physiological functions as the absorption of solutions by the gills or alimentary tracts of animals, or by the body integument and other tissues of plants and animals, the excretion of fluid wastes by kidney or body integument, the ascent and transpiration of water in plants and the maintenance of a biologically necessary colloidal state in normal protoplasm. Those who investigate the chemical aspects of any of these processes are concerned with such studies as endosmosis, exosmosis, capillarity, imbibition, syneresis, hydrophilia (or the "binding" of water), membrane hydrolysis, the Donnan effect, sol-gel equilibria, the stabilization or coagulation of biocolloids by electrolytes or other solutes and kindred basic phenomena.

A term selected as a name for the essential aqueous changes brought about in an organism by the cooperation of any of these hydraulic forces should be simple, direct in meaning and preferably homogeneous with respect to the language of its origin. I am suggesting the word *hydrosyntaxis* (or hydrosyntaxy) to signify the sum total of those functions *within the organism* that are immediately operative in bringing about and maintaining the delicate water balance between protoplasm and its external environment.

The Greek word ὕδωρ (water) or ὕδρα (akin to water) signifies not only pure water, but the aqueous bodies of river, lake or ocean water, as well as any of the biological fluids. Therefore, since the aqueous changes between living organisms and their environment and similar changes in simple synthetic models take place with water playing the major and indispensable rôle, the all-inclusive prefix "hydro-" would seem to be justified. The suffix "syntaxis," derived directly from the Greek συνταξις (adjustment, regulation, or arrangement), is perhaps the most fitting term to be used in naming the situation.

Should we select a suffix to mean "transfer," "transportation" or "exchange," the emphasis of the concept might be laid upon the experimental means of *measuring* an aspect of the more fundamental function of the organism. Similarly, terms signifying such phenomena as sorption, secretion, hydrophilia, etc., would present merely a part of the picture of hydraulic activity within the organism. The suffix "syntaxis" is therefore suggested as being of the broadest significance for the group of complex phenomena involved.

Regarding the prefix, several alternate terms have suggested themselves, but each has a specific fault that makes its recommendation questionable. Thus, "humoro-," although from a good Latin word, seems cumbersome, antiquated and not without a degree of ambiguity. "Hemo-" and "sero-" have a manifest narrowness in connotation. I was tempted to recommend "plasmo-" as a fitting prefix, but was reminded that it, like "sero-," has also come to connote the blood-plasma specifically, in medico-chemical parlance. The terms "osmosyntaxis" (unless this be interpreted to signify something to do with the sense of smell, from the Greek οσμη) or "halosyntaxis" provide a description of a considerable part of an organism's body-fluid regulation, but do not present the entire picture, as would the more general term "hydrosyntaxis," the meaning of which includes osmotic adjustment as well as phenomena such as imbibition, syneresis and others.

Some single, relatively simple term denoting the intra-somatic, cooperative manifestation of these complex water activities should, besides being convenient, serve to keep in the minds of investigators the several components of which the water and salt balance of an organism is the integrated expression.

Further remarks or communications on this subject will be useful.

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ANTECEDENT LIGHTNING PROTECTION

THE most interesting discussion by Dr. Whitehead and Dr. Lloyd[1] concerning the ability of a lightning rod to reduce the danger from lightning by gently discharging the lightning cloud or, what is the same thing, reducing the potential gradient above the lightning rod, has been carried forward on qualitative rather than quantitative lines. This tends somewhat to obscure their essential agreement on principle, for both state that there may be gentle discharge from the point of a lightning rod, although the amount of such discharge is called in question.

It is not surprising that a quantitative discussion of lightning should be avoided, for there are few electrical phenomena so little amenable to quantitative treatment, but an estimate of the order of magnitude of the dimensions involved might somewhat clarify the point at issue.[2, 3]

A vigorous corona discharge from a pointed electrode may represent a flow into the air of 1 milliampere of current; such a discharge would be brilliant at night, and under favorable circumstances could be seen in the daytime. It would require a powerful electric field, many times that required to initiate discharge. A weaker electric field of only twice the corona-forming gradient would result in discharge from the end of a 1 mm diameter wire of a current of the order of 10^{-5} amperes; such a discharge would be visible on a dark night.

In the electric field that accompanies lightning, the released charge would be swept away from the lightning rod, toward the lightning cloud, at a rate that might approximate 1,000 meters per second. The free charge in space above the rod would be between 10^{-8} and 10^{-6} coulombs, depending on the vigor of the discharge. This is enough to distinctly alter the electric field near the tip of the rod, but its effect as one approaches the cloud would be vanishingly small. If the potential difference between cloud and ground is maintained constant, the influence of space-charge issuing from a rod will be to increase the potential gradient at the cloud directly above the rod and to lessen the gradient in the immediate vicinity of the

[1] SCIENCE, December 1, 1933, December 29, 1933, February 23, 1934.

[2] J. S. Townsend, "Electricity in Gases," Oxford Univ. Press.

[3] F. W. Peek, "Dielectric Phenomena in High Voltage Engineering," McGraw-Hill.