olic institution near Niagara Falls, have been destroyed by fire, supposed to have been of incendiary origin, involving a loss of $70,000.

Herr von Miquel, Prussian Minister of Finance, has proposed a plan for taxing professors of medicine who also practice. His plan would result in paying no salary to professors who have a practice of the value of $5,000.

Dr. Steven Crowe and Dr. E. S. Pillsbury have been elected lecturers in bacteriology in the College of Physicians and Surgeons, San Francisco.

The University of Pennsylvania has this year awarded five senior fellowships, two honorary fellowships, fifteen regular fellowships for men and five for women and the Hector Tyndale Fellowship. The awards in science are as follows: *Senior Fellowship:* Chemistry, W. L. Hardin. *Honorary Fellowships:* Botany, A. F. Schweley and S. C. Schmucker. *Fellowships:* Pedagogy, C. D. Nason; Chemistry, Alfred Tingle; Biology, J. M. Greenman; Mathematics and Astronomy, J. M. Hadley; Sociology, G. R. Wicker; Mathematics, J. B. Faught. *Fellowships for Women:* Psychology, A. J. McKeag; Chemistry, L. G. Kollock. *On the Hector Tyndale Foundation:* Physics, M. G. Lloyd.

Dr. Georg Klebs, of Basle, has been appointed professor of botany in the University at Halle. Dr. Hefs has been promoted to a full professorship of physics in the Lyceum at Bamberg. Dr. Holde has qualified as docent in chemistry in the Technical Institute at Charlottenberg, and Dr. Kopsch in anatomy in the University of Berlin.

DISCUSSION AND CORRESPONDENCE.

STABILITY IN GENERIC NOMENCLATURE.

In the June number of the *Botanical Gazette* Dr. B. L. Robinson has called attention to the fact that the Rochester Rules do not provide criteria for determining the application of generic names. It is also pointed out that a strict interpretation of the principle of priority would demand that the first species placed under a genus should serve as its nomenclatorial 'type,' to which the name should remain attached. The execution which such a rule would work among the older names is, it appears, the reason why the makers of the Rochester Code have hesitated to enact or put it in practice. This omission is criticised as gravely inconsistent in a system of 'absolute and decisive character.'

Much nomenclatorial discussion has failed of any definite purpose for lack of agreement as to the nature of the taxonomic problem. Consciously or unconsciously, systematists belong to two schools, representing, for the purposes of illustration, the idealists and realists. According to the former, systems of classification and their categories are mental concepts merely—pigeon-holes, so to speak, into which the individual units of biologic phenomena can be assorted. If the arrangement of the pigeon-holes prove too inconvenient, changes may be necessary, but these are made with reluctance, and it is fondly hoped that each readjustment may be the last. The idealistic systematist views nature from the standpoint of the system, and while he may not be a philosophic idealist as well, and deny the material existence of the objects of his study, he not infrequently declares, and uniformly acts on the opinion, that species, genera and families do not exist in nature, but are *made* by the naturalist. In accordance with this view, the various categories mentioned consist primarily of *definitions* to which names are attached. The usage of the earlier systematists corresponded somewhat to our present custom of patenting new inventions. If the definition or specification proved faulty it was set aside, name and all, and a supposedly improved combination of characters was arranged for the consideration of posterity. This was entirely just and logical, for if the genus (definition) did not correspond to anything in nature it was of no use to the naturalist and should properly give way to the clearer concept of the later student with his presumably wider knowledge of forms. No uniformity nor stability could come, however, from such a method; biologic progress would mean an endless succession of names, an infinite mass of competing generic concepts to be sifted and arranged, constituting an almost insurmountable barrier between nature and formal knowledge. To avoid this threatened chaos it became customary to retain older names, emend the descriptions and credit

the genus to the emendator. Confusion also attended this practice in that it soon became difficult to ascertain the character and importance of the changes worked by successive students, and opinions greatly differed as to the merits of the various references, so that on the ground of convenience merely there has been an increasing tendency to credit the genus to its original author, the inventor of the name, and ignore the fact of subsequent emendation. This is, then, a practical abandonment, for nomenclatorial reasons, of the custom of treating the genus as a mental concept, and the purport of the original description has come to be so far ignored that the Rochester Code bases botanical nomenclature on a work which contained no definitions of genera, necessitating that all knowledge of them be gained by inference from the included species.

But the above view as to the nature of genera is as false in theory as it has proved impossible in practice. Species, genus, family and order are as actual and real as regiment, division and corps or other collective nouns. It may not be possible to define the terms to the satisfaction of all, but for nomenclatorial purposes it is quite sufficient to know that a species is a group of individuals, and a genus a group of species. If we think of a species as an island in the sea of extinction a genus is an archipelago, a group of neighboring islands. There being no biological latitude and longitude, we are obliged to indicate the islands and the group by describing them. The history of geographical discovery has proved that it is not easy to distinguish by description between numerous similar islands, and systematic science has in the last decades abandoned the description as the final resort for the interpretation of the species and taken to the original specimen or 'type.' It is still protested by the surviving idealists that no single specimen can give an adequate idea of the species, and nobody claims that it can, but the desirability of a single definite nexus between nature and science is rapidly becoming patent to all. A complete description of a species can only be drawn after it is known throughout its range and variations, and until its entire life-history has been ascertained, but the preservation of a type specimen renders easy and definite the settlement of questions which could in many cases never be positively decided otherwise. The discoverers of an island may reach it from different sides, and may disagree in the accounts of what they saw, but if their points of observation are known later travelers can harmonize the discrepancies, correct the errors and complete the description.

The method of types is rapidly becoming universal in the study of species, but with respect to genera the idealists are still much more in evidence. The case is, however, exactly the same. A genus being a group of species, it is more satisfactory and final to know one of the species than to hear any amount of general remarks about the group as a whole, especially if the region has not been thoroughly explored and mapped. The discoverer of a new genus simply recognizes that a certain species, or more, lies at a distance from any of the groups which have been previously designated as genera. In a majority of cases he becomes aware of this fact through observation on some single species, which he proceeds to describe and figure with special care. He may not know the size, direction or extent of his new archipelago; all the general characters he alleges as features of the group may fail in the light of later study, and yet the fact would remain that he had first recognized as distinct from all others that particular group of species. As before, the genus cannot be truly defined, the characters by which it is distinguishable cannot be formulated, till all the species are known. The characters might, indeed, long elude us without impairing the distinctness of the genus. The species and genus, in the realistic view, are in an important sense independent of characters, the formal characters being the means of pointing out the group, rather than the primary ground of its existence. The description, whether by ancient or modern writer, loses its sanctity and is distinctly subsidiary in authority to the type.

The idealistic theory having proved impracticable, the method of types is being rapidly substituted, even without the recognition of a logical base for its use. An objection is sometimes raised that as the early systematists did

not work under this method it cannot be justly applied to their groups. This criticism is, however, entirely misplaced, for strict justice would result in setting aside nearly all their genera, as they served those of their predecessors, for scarcely any were adequately defined. The modern custom is not only just, but generous, since it proposes to incorporate and give permanent recognition to groups which under their authors' theories would be in continued jeopardy.

The method of definition and the method of types tend, indeed, to converge in practice and might ultimately coincide as knowledge became perfect. The point of view, however, has a very important bearing on the question of stability of generic names during the constant process of change which increasing insight into nature must work in any system of classification. If a genus is a definition its application will continue a matter of individual preference and doubt, but if a genus is a group of species it will, in accordance with the law of priority, bear the oldest name first used to designate any of its members. The method of types as applied to genera rests, accordingly, on a more important consideration than its convenience as a rule of nomenclature, and the use of the first species as the type of the genus in cases where the author did not himself designate a type has a more important sanction than attaches to it as an extreme development of the principle of priority, for it, or some similar rule, is necessary to any *system* which undertakes to produce stability in the application of generic names. The only alternative method yet suggested is that of elimination; it is an invention of the idealistic school, is ambiguous and difficult of application, and is directly inimical to stability, since one readjustment in generic names may necessitate numerous others, even in distinct families. The method of types renders the application of generic names absolutely stable, and by this very stability provides the flexibility so necessary in allowing classification to keep pace with increasing knowledge. To secure these ends seems quite as important as much of the existing legislation, but several American botanists of prominence to whom these reasons have been presented at length, while admitting the correctness of the contention, hesitate, like Dr. Robinson, to advise the sweeping changes which would be required.

The second element which, if not overlooked, has not been formally reckoned with in plans for nomenclatorial uniformity is human nature. Some have believed that almost any system or treaty of agreement once adopted by a majority would soon become universal.

Drs. Kuntze and Robinson deny this with emphasis. The former says: "The rules of nomenclature should neither be arbitrary nor imposed by authority. They must be founded on considerations clear and forcible enough for every one to comprehend and be disposed to accept." (Codex Emendatus, Art. 2.) And Dr. Robinson makes two separate declarations to the same effect: "Surely those who have themselves discarded hundreds of names which had stood unchallenged for nearly a century should not feel that they are establishing their system merely by putting it into use. The only way it can be established is by making it so reasonable and consistent that it will command general respect and approbation." (P. 438.) "But no system which is not in itself logical is likely to stand the test of time." (P. 440.)

These strike the keynote of the whole question of systems. There are those, and not a few, who will yield adherence to no system which does not appear to them coherent, complete, catholic. The system, if anything, must be everything; considerations of convenience have little weight with these true systematists. Any exception, deviation or ambiguity is a blot which disfigures the whole fair page and must be removed at any cost of time or pains. It is of no use to say that all nomenclature is for convenience merely; that it is a means, not an end; that its purpose is to save, not increase, labor. Then, too, it is idle to leave out of account the personal and moral elements. The satiated describer of hundreds of species may profess that the question of justice is not pertinent, but justice is, and doubtless will remain, at least equally important with logic. If we do not realize this ourselves we need only observe the enthusiastic amateur who leaves the luxuries of wealth and position to ransack the

world for a new bird, orchid or butterfly. Will he respect a system which legislates away from others an honor he so greatly covets for himself?

There is, perhaps, no sufficient *reason* why we may not make any number of exceptions, set chronologic limits, or otherwise minimize the changes which would attend the thorough application of the principle of priority, under the method of types, but if ultimate uniformity is our aim it will probably prove unwise to include any such modifying principles or rules; unwise, not for botanical, but for human considerations, because there are and will be those to whom the reasons for our exceptions will not appear sufficient; whose regard for the system will demand its emancipation from all artificial trammels, none the less because these are a legacy from a past which recognized carelessly, or not at all, the principles now considered fundamental. A fifty-year concession, for instance, is one of the specious suggestions of the Continental botanists. This apparently simple arrangement would duplicate the difficulties which Dr. Robinson finds in applying the Rochester Rules. Who would decide what constitutes 'use'? Would mention as a synonyn in a compiled work like the 'Index Kewensis' be sufficient to save a name from oblivion? What about the numerous genera of fungi, for instance, which have not been rediscovered in the last half century and may not be found again in the next? That the Editor of the Synoptic Flora takes ground against the Rochester Rules because of their incompleteness furnishes weighty evidence that there are but two practical nomenclatorial alternatives, a definite, complete and invariable system elaborated, as far as possible, on the line of a single principle, or a return to the chaos of unguided individual preference. Dr. Robinson must be either an extreme radical or an ultra-conservative, or be open to exactly the same criticism which he visits upon the Rochester Rules. If these Rules lack any of the attributes of a successful system they must be supplied under pain of ultimate oblivion, but those who do not follow the Rules must either go farther, as Prof. Greene and others have recently done, or they must not claim consideration as apostles of uniformity, at least until they have proposed a system which they are ready to adopt.

The practical incompatibility of usage and uniformity is well illustrated by Dr. Robinson on page 438, where, starting with a recognition of the 'great value of priority,' it is soon found that principles 'should be based upon usage and derive their guiding power by stating, generalizing and correlating usage, and not by defying it.' It may be questioned whether this second system sketched by Dr. Robinson is really a system at all in any practical sense, since it would, as there indicated, leave nomenclature in the same condition as grammar, where between conflicting rules individual taste is the only arbiter. As a system all the complicated parts of such a code would be open to criticism and invite disagreement. Usage has never produced any general or permanent uniformity in manners, government, literature or science, and no reasons are apparent for supposing that it ever will. There could scarcely be a uniform logical system founded upon usage. The idea involves a contradiction of terms, and a plea for usage is, in effect, a plea for anarchy.

To some the Rochester Code recommended itself not so much as a perfect system, but rather as a ground of compromise in the interest of uniformity in nomenclature. As with all compromises, neither the radicals nor conservatives are satisfied, and criticism is possible from both standpoints. The existence of a considerable amount of literature based on the nomenclature of the Rochester Code does not improve the character of that document as a system, but it tends to lessen the force formerly carried by the argument from usage. The event shows already that the chief obstacle to uniformity is not, after all, usage, for that can be changed, but that it lies rather in the elements of human nature noticed above, whereby the earnest systematist is impelled to insist upon considerations of justice and logic which to him appear axiomatic and promise universality. It is becoming certain that systematic workers demand a *system*, and Dr. Robinson emphasizes the demand that the system shall be not only logical and consistent, but that it be complete and definite to the extent that if honestly followed it will produce the uniformity which is at

once its purpose and test. In accordance with this view, it might prove simpler, as well as more honest and logical, to make any desired concessions to usage as exceptions rather than by introducing subsidiary rules of doubtful sanction, such as the fifty-year limit. We could then work with the ideal before us, and such differences as continued to exist would concern particulars merely.

Many of the points treated in the various codes are, relatively, matters of slight importance, and are doubtlesss capable of being settled for all except the most cantankerous by simple rules or by-laws which might accompany a general platform or code, since in many such matters usage furnishes the only criterion of judgment and no logical or moral principles are involved. Instead of being essentially complicated, however, nomenclature is in reality a very simple matter. Stability and uniformity are the prime requisites, and these can be attained under the binominal system by adhering to the use of the oldest specific name without regard to generic reference, and by confining the application of a generic name to the genus in which its assigned type or first binominal species is included. The complicated and debatable nature of the various codes arises from the neglect of these principles or from attempts at limiting their application, either for avoiding bibliographic labor or in the interests of usage.

O. F. Cook.

U. S. National Museum,
July 27, 1898.

SCIENTIFIC LITERATURE.

SOME RECENT WORKS ON MECHANICS.

A Treatise on Analytical Statics. By E. J. Routh. Cambridge, University Press. 8vo., Vol. I., pp. xii + 407, 1891; Vol. II., pp. xii + 224, 1892.

Traité de mécanique rationelle. Par Paul Appell. Paris, Gauthier-Villars et Fils. 8vo., Vol. I., pp. vi + 549, 1893; Vol. II., pp. vi + 538, 1896.

The Elementary Principles of Mechanics. By A. Jay Du Bois. New York, John Wiley & Sons. 8vo., Vol. I., pp. x + 231, 1894; Vol. II., pp. viii + 392, 1894; Vol. III., pp. x + 296, 1895.

Dynamics. By P. G. Tait. London, Adam and Charles Black. 1895. 12mo. Pp. xii + 361.

Elements of Mechanics. By Thomas Wallace Wright. New York, D. Van Nostrand & Co. 1896. 12mo. Pp. viii + 392.

Applied Mechanics. By John Perry. New York, D. Van Nostrand & Co. 1898. 12mo. Pp. viii + 678.

Ueber die Theorie des Kreisels. Heft I., Die Kinematischen und Kinetischen Grundlagen der Theorie. Von F. Klein und A. Sommerfeld. Leipzig, B. G. Teubner. 8vo. Pp. iv + 196.

The didactic excellence of the numerous treatises on the principles of mechanics which have appeared in recent years demonstrates an increasing appreciation of the importance of those principles and a progressive effort towards brevity and lucidity in their exposition. The doctrine of energy, now about half a century old, has not only supplied new ways of visualising the familiar and of investigating the unfamiliar in mechanics, but it has also forced us to recognize the omnipresence of mechanical phenomena. The growth of this doctrine and the accompanying developments of the mathematico-physical sciences have furnished, during the past twenty years especially, extensive additions in subject-matter and in applications not hitherto available to writers of works on mechanics. Almost equally important with these additions in the way of material are the improvements in terminology which have been slowly but surely gaining general approval during the present half century. The new points of view afforded by the doctrine of energy, and the critical spirit which has given precision to the terminology, have led also to a revision of the foundations of mechanics. Recent writers devote much space to explanation, illustration and discussion of the so-called axioms of the science; and the trend of current thought is toward the conclusion that most of these axioms are not such at all in the Euclidean sense, but that they are facts of nature which have been discovered by observation. Less stress than formerly is now laid on alleged mathematical proofs of mechanical principles and more attention is given to the phenomena wherein