has been said should give encouragement to such speculations. On the other hand, I have a very firm conviction that we should not be content with rounding out organic chemistry as a descriptive science nor even with adding to the number of empirical rules which enable us to predict certain classes of phenomena. We must, instead, place before ourselves the much higher ideal of gaining a clear insight into the nature of atoms and molecules and of the forces or motions which are the real reason for the phenomena which we study. When we consider the progress which has been made and the knowledge of structure we now possess, which would have appeared sixty years ago to lie beyond the limits of possible acquirement, it is not presumptuous to think that a more complete knowledge of these questions will at some time be gained. This fuller knowledge will take account, too, of many lines of work upon which I have no time to dwell, such as the question of changing atomic volume to which Professors Richards and Traube have directed our attention, and the knowledge of heats of combustion, of molecular refraction and dispersion, of color, viscosity, dielectric constants and other physical properties. The future must give to us a new theory or a development of old ones which shall include all of these phenomena in one comprehensive view.

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SCIENTIFIC BOOKS.

MUSEUMS AND MUSEUM APPLIANCES.

The Museum. By L. P. GRATACAP. Reprinted from the *Journal of Applied Microscopy and Laboratory Methods,* Vols. V. and VI.

Bericht über einige Neue Einrichtungen des Königlichen Zoologischen und Anthropologisch-Ethnographischen Museums in Dresden. Von Dr. A. B. MEYER. 4to. Pp. 25; pls. I.–XX.

The first of these is a reprint of Mr. Gratacap's series of papers which appeared in the *Journal of Applied Microscopy* and is a pamphlet of about 100 pages with many illustrations. In book form it would make a good-sized volume and as these articles contain a good résumé of the principles of museum construction and methods of installation, it is a pity that they could not have been issued in such shape. Mr. Gratacap is well qualified to treat of museum matters, and since there is not space to note all the good things he says, it must suffice to discuss a few concerning which there may be room for a difference of opinion. The first is to be found almost at the beginning, where Mr. Gratacap makes a plea for a uniform system in museum methods. The field covered by museums is so vast and the educational features at present so little developed that there is ample scope for diversity in the treatment of museum exhibits, the more that those features that are universally good can only be ascertained by experiment, to say nothing of the fact that the ends sought for may be very different in different museums. To illustrate this we may consider the questions of the display of skeletons and of fossil vertebrates. If the aim is to show the structure and relationship of vertebrates as a whole the two should be combined, the number of specimens should be limited, and fragmentary fossils almost entirely excluded, this being a case where a cast or good drawing is much better than an imperfect specimen, since it is necessary to compare animals in their entirety. If the object is to show the succession of life on the globe, then the fossils should be arranged zoologically under their respective geological periods, so that the visitor can see the successive steps by which the present fauna of the globe has been reached. Still a third arrangement of fossil vertebrates is possible, that adopted by Professor Osborn, of showing by numerous specimens the phylogeny of various groups. If it is desired to show the structure and characters of vertebrates, then skeletons and other anatomical preparations may be placed with mounted animals. No one museum can do all these things and each institution must decide on the plan that best suits its circumstances.

Mr. Gratacap considers the plan and structure of museum buildings, touching particularly on their lighting, and devotes considerable space to case construction, important matters concerning which architects as a rule display lamentable lack of knowledge. It is possible that an architect may, unaided, have designed a good museum case, but if so the reviewer is not aware of the fact, architects' cases being clumsy, poor as to light, and calculated to catch the dust. As to the lighting, it may be said that plate glass should never be used in the windows of museums, but ground glass or luxfer prisms. It is impossible to control the sunlight by the use of curtains and in almost any museum one may at times see the sunlight pouring in and ruining valuable specimens. Diffused light is not only better for the specimens, but better for visitors. Again, windows should not reach to the floor, but be well above it, not merely to give wall space, but because experiment has shown that the best light comes from above, the upper third of a window equalling the lower two thirds in illuminating power. Windows in museums are for the purpose of admitting light, not for giving a view of the surrounding country. Also each window should be fixed so that it may not be opened for the admission of dust and smoke; it is time that museums were ventilated on scientific principles (a few are) and not after the manner of a wigwam. And in the present day of electric lighting it should be an easy matter to overcome the difficulty of dark corners. This leads one to say that it will not be long before more attention is given to lighting exhibition cases from the inside, where the objects displayed can be well illuminated and the exasperating shadows attendant to external lighting avoided. Mr. Ward, of the Milwaukee Museum, has secured extremely good results in this direction, and it has also been used in the large Bass Rock group in the Ipswich Museum, England. Still a word or two more concerning cases, which are treated in considerable detail and are objects about which Mr. Gratacap's wide experience enables him to judge of what should be adopted and what avoided, but it may be added that seven feet is high enough for the average museum case; most large mammals may be accommodated in a case nine feet high and anything over that height is for groups or special exhibits.

The sliding partition, which Mr. Gratacap views with distrust, is neither awkward nor unnecessary, and in the U. S. National Museum the idea has been further elaborated by having the entire bottom of a case running on trunk rollers, and removable. These devices permit the use of large, fixed plate glass panes for the sides of cases and restrict the movable sash to the minimum. A case can not be made that is at once dust-tight and easy of access, and as exhibits are only changed at intervals some concessions may be made. Brackets, pedestals, mountings and labels, each and all claim attention, but the use of many of these depends on the amount of money or size of the working force available. The poor curator may be forced to hang specimens from wires instead of using elaborately finished brass fittings, but, after all, there is a great deal of installation that might be improved with a little thought and care. The average museum errs on the side of endeavoring to show too much; ten good specimens well displayed are worth one hundred badly installed.

Turning now to Dr. Meyer's memoir, which follows the lines of one published about ten years ago, one notes many improvements in cases and methods of installation which Dr. Meyer has found time to devise. He is an ardent advocate of iron cases and, if we remember aright, was the first to work out the details of their construction and bring them into use on any extensive scale.

In the United States he has been followed by Dr. Jayne and Dr. Greenman, of the Wistar Institute, where a plant has been installed for the manufacture of cases for that institution. In the matters of lightness of construction, resistance to changes of climate and safety from fire the iron case is indubitably far in advance of any other. Nevertheless, it has certain drawbacks, including cost and time of construction and, with all due deference to Dr. Meyer, appearance. Pri-

marily a case is for the preservation of specimens, but secondarily it plays an important part in furnishing a museum and this fact should not be lost sight of. A series of huge glass boxes does not form an attractive sight, and at the Wistar Institute it was found necessary to provide the cases with a cornice to mitigate the bareness of their appearance. This criticism applies also to the all-glass case, with the additional remark that we have not yet seen a large glass case through whose joints it was not possible to slip a card.

For storage, library and office use and for purely practical purposes the iron case has no equal, and it is to be hoped that the time may soon come when such cases can be made at a reasonable price and in a reasonable time. From the variety of design shown in Dr. Meyer's paper it would seem that the above conditions have been satisfactorily met in Germany, or broadly speaking, in Europe, for iron cases have been extensively adopted during the past decade. Dr. Meyer gives various views and plans for floor and desk cases, storage cases for insects and eggs, catalogue cases, and bookcases in which a vertical row of shelves may be withdrawn when books are needed or closed flush when not in use. Incidentally Dr. Meyer calls attention to the good results obtained by the use of dyed sawdust as a medium in which to arrange eggs, since this affords a good background and at the same time holds the eggs in any desired place. Naturally it is necessary to be sure that nothing in the dye will affect the eggs. Turnstiles, adjustable trucks for moving cases, swing screens, mountings for skulls and skeletons, are among the things figured and described, all bearing testimony to the thought and time Dr. Meyer has given the subject of museum furniture.

F. A. L.

Madreporaria. Parts I. and II. By J. STANLEY GARDINER, M.A. (From 'The Fauna and Geography of the Maldive and Laccadive Archipelagoes,' Vol. II., Part 3, pp. 755–790, Pls. LIX. to LXIV.)

This, the first instalment of Mr. Gardiner's report on the Madreporaria collected by the expedition under his charge to the Maldive and Laccadive archipelagoes, contains: (1) Introduction with notes on variation, (2) the Astræidæ.

I. *Introduction with Notes on Variation.*—The collection contains over 1,000 specimens of dried corals besides a large number in spirit and formalin and a quantity of smaller pieces for comparative purposes. The collections were obtained mainly from (*a*) Minikoi, the most southern bank of the Laccadive Group; (*b*) Goidu, the east island of Goifurfehendu atoll; and (*c*) Hulule, the most southeasternly island of N. Male atoll. An attempt was made to collect as thoroughly as possible—particularly at Minikoi and Hulule—for the comparison of the localities with one another, and specimens were not generally taken from reefs elsewhere. In addition, dredgings yielded a considerable number of specimens, although few hauls were taken on the outer slopes of the reefs.

Mr. Gardiner made a series of observations in order to ascertain how far mode of growth is dependent on light and environmental conditions and had intended to publish these observations, but thinking that the subject had only a limited interest and because of the cost of suitable illustrations, he did not give his observations in full, merely indicating as briefly as possible under each species the variation found in the several colonies due to these causes. It is very much to be regretted that Mr. Gardiner did not present in full the data that he had accumulated on this subject. It is very doubtful if we shall ever obtain a real insight into what constitutes species in corals without studies of the kind which Mr. Gardiner apparently made and without a full presentation of such data. Quite likely considerable experimental work will be necessary in order to ascertain more definitely the influence of certain environmental conditions, such as experiments in planting the young from the same parent colony in different localities where the conditions of growth are different, and observing the resultant growth forms.

Mr. Gardiner divides the variation shown by corals into three classes: (*a*) *Vegetative,* that is the variation that is due to environmental conditions. (*b*) *Continuous,* where a

series from one locality grades into a series from another locality; this kind of variation is exceedingly complex and almost impossible to distinguish from the vegetative. (*c*) *Discontinuous* or *specific* variation. The author says a species in one locality may show *discontinuous* variations in one or more characters, but it by no means follows that the same discontinuous variations will be shown by the same species in a different locality. Work on a collection from a single locality is best calculated to bring out the phenomenon, but one requires a collection from some other locality for comparison.

II. *Astræidæ*.—About 400 of the specimens collected belong to this family. They are divided into 69 species and 21 genera. The author obtained in the Pacific only 12 genera, and Klunzinger obtained from the Red Sea 16 genera (omitting synonyms). This shows that in the Maldive and Laccadive archipelagoes this group of corals is quite rich in both species and genera. In the arrangement of the genera Duncan's classification is followed, and the author correctly says this work is in need of thorough revision.

The following is a list of the genera with the number of species referred to each, and the names of the forms considered new:

Antillia, 1, *A. constricta* Brug., var. *maldivensis* nov.; *Cylicia*, 1; *Tridacophyllia*, 1; *Euphyllia*, 2; ?*Mycetophyllia*, 1; *Mussa*, 1; *Symphyllia*, 1; *Cœloria*, 6, *C. cooperi*, nov., *C. magna*, nov.; *Leptoria*, 1; *Hydnophora*, 4, *H. grandis*, nov., *H. maldivensis*, nov.; *Favia*, 10, *F. adduensis*, nov., *F. laccadivica*, nov., *F. hululensis*, nov., *F. parvimurata*, nov.; *Goniastræa*, 4; *Aphrastræa*, 1; *Orbicella*, 8, *O. minikoiensis*, nov., *O. borradailei*, nov.; *Cyphastræa*, 6; *C. suvadivæ*, nov., *C. maldivensis*, nov.; *Echinopora*, 4; *E. tertia*, nov., *E. magna*, nov.; *Galaxea*, 5; *Stephanocœnia*, 1, *S. maldivensis*, n. sp.; *Acanthastræa*, 1, 2 vars.; *Prionastræa*, 7, *P. suvadivæ*, nov.; *Merulina*, 2.

The reviewer thinks that it is to be regretted that Mr. Gardiner followed the classification of Duncan. Since the publication of the latter author's 'Revision of the Families and Genera of the Madreporaria,' considerable progress has been made in the classification of the Madreporaria and in the correction of the nomenclature. The family name Astræidæ can not be used in corals because no genus of corals can bear that name. A discussion of the name *Astrea* or *Astræa* will be found in the reviewer's 'Eocene and Lower Oligocene Coral Faunas of the United States.'* It has been known for some time that the genera referred to this family by Milne Edwards and Haime would have to be distributed in quite a number of families. Attempts at reclassification have been made by Verrill, Koby, Ogilvie-Gordon, Gregory, Felix and the reviewer. Morphologic proof of the correctness of some of these attempts has recently been published by Professor Duerden in his 'Recent Results on the Morphology and Development of Coral Polyps.'† It seems that it would have been preferable for Mr. Gardiner to have utilized this literature and arranged his specimens more or less in accord with the suggestions contained there; but it must be admitted that the results so far obtained are not always definite, and Mr. Gardiner would have been obliged to supplement by his own work these attempts at reclassification. Knowing the present status of the problem, he evidently preferred following the system of Duncan although he knew it was faulty.

Several of the generic names used by Mr. Gardiner will have to be changed. The name *Tridacophyllia*, de Blainville, should become *Pectinia* Oken.‡ According to Professor Verrill§ the genera *Mussa* and *Symphyllia* must be combined. The genus *Cœloria* is considered separate from *Mœandrina* M. E. & H. (not *Meandrina* Lamarck, 1801). Both Professor Verrill and the reviewer believe that the species hitherto divided into those two genera should be combined into one. This

* 'Monograph U. S. Geological Survey,' Vol. XXXIX., p. 154, 1900.

† 'Smithsonian Miscell. Coll. Quart. Issue,' Vol. XLVII., pp. 93–111, 1904.

‡ Vaughan, 'Some Fossil Corals from the Elevated Reefs of Curacao, Arube and Bonaire,' *Samml. Geolog. Reichs.-Mus. Leiden*, ser. ii., Bd. II., p. 15, 1901.

§ *Trans. Conn. Acad. Sci.*, Vol. XI., p. 177, 1902.

point can scarcely be discussed here, but examinations of large suites of material have convinced the reviewer that the criteria used by Mr. Gardiner for their differentiation are not valid. That is, he says, '*Cœloria* has a true columella, whereas *Mœandrina* has merely trabeculæ extended out from the septa to fill up the axial fossa.' The generic name *Hydnophora* was originally proposed by Fischer v. Waldheim, 1807, for a genus of Paleozoic corals and can not be used for the recent corals to which the name was applied by Milne Edwards and Haime.* *Monticularia* Lamarck, 1816, is available for the *Hydnophora* of Milne Edwards and Haime.

Mr. Gardiner spells such names as *Goniastræa* with the diphthong 'æ.' The original spelling of these names by Milne Edwards and Haime† is with an 'e,' but in their 'Histoire Naturelle des Coralliaires' they change the 'e's' to diphthongs, 'æ's.' The reviewer is of the opinion that the original spelling should be followed instead of the innovation of 1857. The genus *Prionastræa* M. E. and H., should be changed to *Favites* Link.‡

The two criticisms made on Mr. Gardiner's memoir are: (1) He should not have suppressed any data that he possessed regarding the influence of environment on variation. (2) It is regrettable that he has not utilized, and incorporated in his work, recent studies on the classification of the genera treated in his paper, and that his nomenclature is often faulty. However, Mr. Gardiner has given us some of the data regarding environmental influence on variation and his work is thoroughly comprehensible even if he has not utilized modern investigation on the reclassification of these corals. His memoir is decidedly the best contribution that has been made to the so-called 'Astræid' corals of any one area in the Indian Ocean, and its value is very much enhanced by six excellently executed half-tone plates which illustrate 32 out of the 69 species discussed. The criticisms made above may be regarded merely as suggestions for consideration in future work.

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* Trautschold, 'Die Kalkbrüche von Mjatschkowa,' *Nouv. Mém. Soc. Imp. Natur. de Moscou*, t. xiv., p. 38, 1879.

† *Comptes Rend.*, Vol. XXVII., 1848.

‡ Vaughan, 'Fossil Corals from the Elevated Reefs, Curacao, etc.,' p. 21, 1901. Verrill, *Trans. Conn. Acad. Sci.*, Vol. XI., p. 89, 1902.

SCIENTIFIC JOURNALS AND ARTICLES.

THE contents of the October number of the *American Chemical Journal* are as follows:

Contributions from the Chemical Laboratory of Harvard College: 'On Certain Derivatives of the 1,3,5-Triiod-2,4-dinitrobenzol,' by C. Loring Jackson and J. F. Langmaid; 'The Existence of Hydrates in Solutions of Certain Non-Electrolytes and the Non-Existence of Hydrates in Solutions of Organic Acids,' by Harry C. Jones and Frederick H. Getman; 'The Existence of Alcoholates in Solutions of Certain Electrolytes in Alcohol,' by Harry C. Jones and Frederick H. Getman. Contributions from the Sheffield Laboratory of Yale University: CXIX., 'Researches on Pyrimidines: 2-Oxy-4,6-diaminopyrimidine,' by Henry L. Wheeler and George S. Jamieson,' CXX., 'On the Action of Phenylhydrazine on Benzoylpseudoureas: 1,5-Diphenyl-3-aminopyrro-α,β'-diazole Derivatives,' by Treat B. Johnson and George A. Menge'; 'On the Fate of Potassium Myronate in the Animal Organism and Its Hydrolysis by the Ferments of the Liver,' by J. H. Kastle and Eloise Chesley McCaw; 'On the Oxidation of Sulphocyanic Acid and Its Salts by Hydrogen Peroxide,' by J. H. Kastle and Claude Robert Smith. Contributions from the Chemical Laboratory of the Nebraska Wesleyan University: VII., 'The Preparation of Aromatic Nitroso Compounds,' by Frederick J. Alway; VIII., 'The Nitrosocinnamic Acids and Esters,' by Frederick J. Alway and Walter D. Bonner; IX., 'On Certain Nitrogen Compounds,' by Frederick J. Alway and Reuben M. Pinckney; X., 'The Molecular Weights of the Yellow Nitroso Compounds,' by Frederick J. Alway and Ross A. Gortner. Reviews.

The Popular Science Monthly for October may be termed a British Association number, being devoted to the addresses delivered at the last meeting by the presidents of various sections. It opens with 'A Traveler's View of the British Association Meeting,' very pleasantly presented by Henry S. Pritchett and illustrated with views of many of the more noteworthy buildings in Cambridge. Fol-