

be no aërial respiration by the lungs in the tadpole state as the lungs do not communicate with the exterior, but are closed sacs.

The apparent aërial respiration of the toad tadpole is explicable only on the ground that air is taken in and mixed with the water which passes over the internal gills, something as fish go to the surface and gulp air when air dissolved in the water is too nearly exhausted.

Effects of Hydrocyanic Acid Gas upon Animal Life and its Economic Use. W. G. JOHNSON, College Park, Md.

A preliminary report upon a series of experiments with this gas upon animal life.

A Discussion of Aspidiotus cydoniæ and Its Allies. C. L. MARLATT, Washington, D. C.

This paper was published in full in the *Canadian Entomologist* for August, 1899, pp. 208-211, under the title '*Aspidiotus convexus*—a correction.'

The Histogenesis of Muscle in the Metamorphosis of the Toad (Bufo lentiginosus americanus). B. F. KINGSBURY, Ithaca, N. Y.

The author spoke of the occurrence of metamorphosis in the development of certain animals, among them the toad, the necessity of changes in metamorphosis, histolysis and histogenesis of the tissues, etc.; the views on the changes constituting histogenesis of tissues, muscle especially; the results of work on the toad and frog; and the bearing of these results on general biological principles.

The Progenitors of the Batrachians. THEO. GILL, Washington, D. C.

This paper gave evidence showing that the Batrachians are probably descended from a type of fishes most nearly represented in the present fauna by the Polyp-terids.

Observations on the Variations, Life History and Habits of a Mimetic Locust (Ædipoda

maritima Uhl). HERBERT OSBORN, Columbus, Ohio.

Discussion of the possible factors affecting variations in a locust which shows striking protective resemblance and some observations regarding habits and life history.

A Chart Illustrating the Origin and Evolution of Animal and Vegetable Life. A. D. HORKINS, Morgantown, W. Va.

An original scheme for illustrating theories on the origin and evolution of forms, genera, families, orders, etc., of life by means of a disk divided into spaces of various sizes and forms and by curved and straight lines rising from the center of the disk.

Geographical Variations, as Illustrated by the Horned Larks of North America. HARRY C. OBERHOLSER, Washington, D. C.

Discusses the distribution of the Horned Larks; their relation to faunal areas; their distribution compared with other plastic groups; geographical variation in the Horned Larks, and comparison of variation in other groups; anomalies in variation of the Horned Larks; an examination into the causes of geographical variation.

C. L. MARLATT,
Secretary.

SCIENTIFIC BOOKS.

REPORT OF THE FUR SEAL INVESTIGATIONS, 1896-1897.

The Fur Seals and Fur Seal Islands of the North Pacific Ocean. By David Starr Jordan, President of Leland Stanford, Jr., University, Commissioner in Charge of Fur Seal Investigations of 1896-1897; with the following Official Associates: Leonhard Stejneger and Frederic A. Lucas, of the U. S. National Museum; Jefferson Moser, Lieutenant-Commander, U. S. N., in command of the U. S. Fish Commission Steamer *Albatross*; Charles H. Townsend, of the U. S. Fish Commission; George A. Clark, Secretary and Stenographer; Joseph Murry, Special Agent; with

Special Papers by other Contributors. Part 1 [-4]. Washington : Government Printing Office. 1898 [=1899]. 4 vols. 4to. Part 1, pp. 1-249, i.-vii., pll. ia.-ic., iia.-iic., iii.-ix., frontispiece, and 25 unnumbered plates. Part 2, pp. 251-606. Part 3, pp. i.-xii., 1-629, pll. i.-xcv., frontispiece, 6 maps, and a large number of text cuts. Part 4, pp. 1-384, pll. 1-113 (pll. 87-113=maps and charts).=Treasury Department Document No. 2017.

[Although dated '1898,' parts 1, 2 and 4 were issued in July, 1899, and Part 3, not till November, 1899.]

This apparently exhaustive report, consisting of 1637 pages, and 250 plates, charts and maps, is perhaps the most important contribution yet made to the voluminous literature of the vexed question of the Fur Seal industry of the North Pacific, contributed by officials of the United States. The occasion of the present inquiry is thus set forth : "The present inquiry into the condition and needs of the fur seal herds of the North Pacific Ocean and Bering Sea is the outgrowth of a belief on the part of the United States that the regulations formulated by the Paris Tribunal of Arbitration for 'the protection and preservation of the fur seal' had failed to accomplish their avowed object. The inadequacy of these regulations was apparent at the close of the first season of their operation, and each succeeding season has only rendered it more conspicuous. Failing to secure the co-operation of Great Britain in the immediate revision of the regulations, the United States, in the spring of 1896, accepted the proposal of Great Britain for a scientific investigation of the whole subject, to be made independently by each nation, the result of such investigation to form the basis of a reconsideration of the regulations at the end of the special trial period of five years."

Pursuant to an act of Congress, Dr. David Starr Jordan was appointed commissioner in charge of the investigation, with, as associates, Lieutenant-Commander Jefferson F. Moser, commanding the U. S. Fish Commission steamer *Albatross*; Dr. Leonard Stejneger, curator of reptiles, U. S. National Museum; Mr. Frederic A. Lucas, curator of comparative anatomy, U. S. National Museum, and Mr.

Charles H. Townsend, naturalist of the *Albatross*. Great Britain appointed as her commission, Professor D'Arcy Wentworth Thompson, of University College, Dundee, Scotland; Mr. Gerald E. H. Barrett-Hamilton, of Dublin, Ireland, and Mr. James Melville Macoun, of the Geological Survey of Canada; while the Canadian government detailed Mr. Andrew Halkett to investigate the operations of the pelagic fleet. The *Albatross*, with the American Commission and Prof. Thompson and Mr. Macoun of the British Commission reached St. George Island, July 8, 1896, and the members of the two commissions conducted their investigations, usually in company, till late in October. The following year work was begun early in June, and continued till the end of the season, the two commissions working in company at the Pribilof Islands, while Dr. Stejneger made a very thorough survey of the Asiatic fur seal islands and fur seal industry.

Part 1 contains the principal findings of the commission; part 2 consists of supplementary documents, giving in full the basis of these conclusions; part 3 comprises some thirty separate papers by nearly as many different authors, chiefly on the natural history of the fur seal, and on the fauna and flora of the Pribilof Islands; while part 4 is Dr. Stejneger's report on the Russian fur seal islands. Part 1, after stating the occasion and scope of the inquiry, gives a historical summary of the American fur seal industry, followed by an account of the home of the Pribilof Island seal herd, including the geography, climatic conditions, the natural productions, etc., of the islands, and the number, location and character of the seal herds. Chapter IV. discusses the fur seal or sea bear in its zoological relationships, the conclusion being reached that the three herds of northern fur seals—the Pribilof herd, the Komandorski herd, and the Robben Island herd—not only do not mingle, but constitute three distinct species, which are termed, respectively, *Callorhinus alascanus*, *C. ursinus*, and *C. curilen-sis*. The various categories of seals, as regards sex and age, their migrations and life habits are next detailed, followed by a history of the past and present conditions of the Pribilof herd. The decline in the herd is carefully traced and

its cause convincingly set forth, which is primarily, if not exclusively, *pelagic sealing*. The history and effects of pelagic sealing are presented in detail, and the facts speak for themselves; there is no occasion for argument. Statistics show that in the average about 75 per cent. of the seals taken in pelagic sealing are *breeding females*, killed either on the way to their breeding grounds while pregnant, or on their feeding grounds near the rookeries, leaving their nursing pups to die of starvation on the rookeries. In the case of land killing, only certain classes of males are taken, leaving the full quota of females to replenish the herd.

While pelagic sealing is so destructive to the seal herd, statistics show that it is not remunerative, but, on the contrary, is carried on at a pecuniary loss to those engaged in it. "The true nature of the business was plain in 1897, when only 38 vessels, as against 87 in 1896, engaged in sealing." Of this latter number 21 were American and 66 British (*i. e.*, Canadian). The amount of capital invested for this year (1897) did not exceed \$208,000, to be "contrasted with the capital of \$5,000,000 invested in the preparation of the seal skins in London, and with the revenue of \$1,375,000 a year which the United States should by right be enjoying." Pelagic sealing is, therefore, a selfish, dog-in-the-manger business. As said in President Jordan's report (p. 175): "Not only is pelagic sealing a destructive and wasteful industry, but it is suicidal in its nature. It is at best but an insignificant industry. It threatens the destruction of vastly more important interests, and with them its own interests. Pelagic sealing preys upon its own capital. The more successful it is the quicker will come its ruin. Its bankrupt condition to-day is clearly shown in the declining catch and the withdrawal of its vessels." This was perfectly evident to well-informed and unbiased experts in 1893, yet the evidence before the Arbitration Commission was so confused and so vitiated by false statements and false inferences that the rules established by the Paris award for the preservation of the seal herd only fostered its rapid destruction through its provisions in behalf of pelagic sealing!

In this connection it seems proper to quote a

few paragraphs from the report (pp. 175, 176), since they tersely summarize the subject of pelagic sealing and place the odium of its continuance in the right quarter.

"Such is the nature of pelagic sealing, the sole cause of the threatened destruction of the fur seal herd, the sole obstacle which stands in the way of its restoration.

"Much has been said of the legality of pelagic sealing, and to this we take no exception. Pelagic sealing is perfectly legal, but this legality was fixed by a tribunal which was so confused by false testimony and ignorant and worthless affidavits, that, while attempting to formulate measures for the protection of the seals, it legalized the very cause of their destruction. But the whitewash of respectability which was thus put upon pelagic sealing cannot hide its true character. Judged by its methods and results, it is merely a species of legalized barbarism. Pelagic sealing is simply a public nuisance which can now only be disposed of by international agreement.

"It is a great sense of relief that we find ourselves able to record the recent action of Congress in the prohibition of the practice of pelagic sealing by our own citizens, and the exclusion of skins of females from our markets. This step should have been taken long ago. It must be remembered that until the passage of this law Americans as well as Canadians have been engaged in slaughtering the fur seals. * * * And not only have our citizens helped to destroy our own herd, but they have crossed the Pacific and have been instrumental in depleting the herd of friendly Russia. American enterprise has also had the leading part in the practical extermination of the fur seal rookeries of the Kuril Islands, belonging to Japan.

"Henceforth, however, our hands are clean, and we can with dignity and assurance urge that other nations take steps to put an end to the business. Pelagic sealing—with its slaughter of gravid females, and the starvation of their dependent young, with its waste of a noble and valuable animal life, with its threatened destruction of varied and important commercial enterprises, and of the sole source of supply of a commodity of utility and value to mankind—is, from this time on, distinctly a Canadian indus-

try, and under the fostering care of Great Britain. If she permits its continuance, the odium must rest with her."

The remedy proposed by the American Commission for the present decline of the herd is 'the absolute and permanent prohibition of pelagic sealing.' The herd is at present commercially ruined, but it is believed that with judicious management it can be brought up, in the course of fifteen to twenty years, to its former maximum condition.

The recommendations formulated by the commission not only include the complete cessation of pelagic sealing, but recommend that the herd should be "placed permanently in charge of a competent naturalist and practical man of affairs, whose business it shall be to visit the islands each year in the breeding season and to study the condition of the herd and ways for its improvement; to determine the size of the quota which shall be taken, and supervise its taking; in short, to make the needs, possibilities and limitations of the fur seal herd his life study. By such a course the government can hope to have at hand at all times that expert advice and assistance that have been so signally lacking in the past, and which is so essential to the proper administration of its future interests."

Following these recommendations in Part 1 are several appendices, giving statistics pertinent to the preceding discussion, relating to the number of seals killed on the Pribilof Islands and in pelagic sealing, from about 1870 to 1897; also the treaties and other documents between Great Britain and the United States on the fur seal question. Noteworthy among the latter is the joint statement of the fur seal experts of the two governments, drawn up and signed in Washington, at the conclusion of the field work of the two commissions, in November, 1897. The agreement of the two commissions, thus shown upon all matters touching the decline and present condition of the seal herd, and the causes that have led to its present unsatisfactory status, is certainly most gratifying, and augers well for its future.

The numerous illustrations in Part 1 are mainly reproductions of photographs, and illustrate various phases of the subject under dis-

cussion. There are, however, a dozen drawings from nature by Bristow Adams, depicting characteristic types of seal life. A series of photographs illustrate seal life as seen massed on the rookeries; while another set show the methods of driving, killing and skinning; still another set (numbered as plates i.-ix.) illustrate the decline of the herd, the views being comparative views of the same rookeries taken in different years from 1894 to 1897.

Part 2 of the report, forming pages 251-606, is largely a transcript of the daily observations of the commission during the two seasons of its work at the Pribilof Islands, and gives in detail the evidence on which the conclusions of the commission, set forth in Part 1, were based.

Part 3 contains twenty-four distinct chapter headings, fourteen of which relate directly or indirectly to the natural history of the fur seal, occupying pp. 1-339, and the remainder to the general natural history of the Pribilof Islands, the volume, as a whole, forming a most important contribution to the zoology and botany of this now pretty thoroughly known group of islands. These contributions may be briefly summarized as follows: 'I.—The Pribilof Fur Seal' (pp. 1-7), treats of the 'main divisions of the Pinnipedia,' and 'variations in size and color of the Pribilof seal,' by Mr. F. A. Lucas, while Dr. Jordan and G. A. Clark consider 'the species of the *Callorhinus* or northern fur seal,' of which three are recognized, namely, (1) *C. ursinus* (Linn.), constituting the Commander Island herd; (2) *C. alascanus* Jordan & Clark, the Pribilof fur seal; (3) *C. curilensis* Jordan & Clark, the Robben Island fur seal. These species differ appreciably, not only in size, and in the texture, color and commercial value of the fur, but occupy distinct geographical ranges, and do not commingle, even in their migrations.

Under 'II.—The Anatomy of the Fur Seal' (pp. 9-41, pll. i.-viii.), Mr. Lucas describes the dentition of the fur seal, Robert E. Snodgrass, its anatomy, and Pierre A. Fish, the brain of the fur seal, in comparison with that of other Pinnipeds and the black bear.

'III.—The Breeding Habits of the Pribilof Fur Seal' (pp. 43-57, pll. ix.-xi.), is by Mr. Lucas, as is also 'IV.—The Food of the North-

ern Fur Seal' (pp. 59-68, pll. xii.-xv.); 'V.—Mental Traits of the Pribilof Fur Seal' (pp. 69-74), and 'VI.—The Causes of Mortality among Seals' (pp. 75-98, pll. xvi.-xxi.). Chapter 'VII.—Internal Parasites of the Fur Seal' (pp. 99-177, and 100 text illustrations) is an elaborate report by Ch. Wardell Stiles and Albert Hassall, which incidentally includes a notice of the intestinal parasites of other marine mammals.

'VIII.—The early history of the Northern Fur Seals' (pp. 179-222), is a translation of George William Steller's 'De Bestiis marinis' (1751), by Walter N. Miller and Jennie Emerson Miller, and of Veniaminof's account of the sea bear (1839), translated by Leonhard Stejneger—both pertinent to the general subject, and here made accessible to English readers.

'XI.—Pelagic Sealing, with Notes on the Fur Seals of Guadalupe, the Galapagos, and Lobos Islands' (pp. 223-274, pll. xxii.-xxxv., and 2 maps), by Charles H. Townsend, is historical and statistical, and a most valuable and comprehensive contribution.

'X.—Report of an Expedition in Search of the Fur Seal of Guadalupe Island, Lower California, June, 1897; including a survey of the Island, and notes on the Animal and Plant Life of the Region' (pp. 275-283), and 'XI.—Observations during a Cruise of the *Dora Siewerd*, August-September, 1895' (pp. 285-306), are by A. B. Alexander. 'XII.—Fur Seal Hunting in the Southern Hemisphere' (pp. 307-319), by J. A. Allen, is reprinted from the proceedings of the Fur Seal Arbitration (App. to U. S. Case, Vol. I.).

'XIII.—The Rookery Maps of the Pribilof Islands' (pp. 321-324), is a brief report by Jefferson F. Moser, on the past unsatisfactory attempts to construct such maps, with comment on the difficulties of the work.

'XIV.—Practical Experiments in the Branding and Herding of the Seals' (pp. 525-538, pll. xxxvi. and xxxvii.), is by David Starr Jordan and George A. Clark, who claim that, in a method of rendering the skins unsalable, they give the keynote to the whole situation, and, carried to logical conclusions, would 'forever settle the vexed question of pelagic sealing.'

'XV.—The Blue Fox of the Pribilof Islands'

(pp. 339-343), by D. S. Jordan and G. A. Clark, treats of the blue fox as one of the important resources of the islands, from the great commercial value of its fur, and recommends the protection of the herd from undue inroads.

'XVI.—Mammals of the Pribilof Islands' (pp. 345-354), by Frederick W. True, is an annotated list of 12 species. One of these is the introduced house mouse, 4 are seals, and 4 are cetaceans, the only indigenous land animals being a shrew, a lemming, and the Arctic fox. The sea otter and walrus, formerly present, have been exterminated.

'XVII.—The Avifauna of the Pribilof Islands,' by William Palmer (pp. 355-431, pll. xxxviii.-xli.). This paper of nearly 80 pages consists of a carefully annotated list of the 69 species of birds thus far known from the islands, with an analysis of their distribution and a discussion of their migrations. The annotations are often extended and relate not only to the nesting and other habits, but to changes and conditions of plumage, etc. Pl. xxxix. shows variation in the markings of the eggs of the Pacific murre, and pll. xl. and xli. the development of feathers.

'XVIII.—The Fishes of Bering Sea' (pp. 433-492, pl. xlii.-lxxxv.), is by David Starr Jordan and Charles Henry Gilbert; 229 species are enumerated and several are described as new, while many others are for the first time figured. This general title covers also a paper by Norman Bishop Scofield, entitled, 'A List of Fishes obtained in the Waters of Arctic Alaska' (pp. 493-509), enumerating 33 species.

'XIX.—A Contribution to the Knowledge of the Tunicata of the Pribilof Islands' (pp. 511-537, pll. lxxxvi., and 28 text figures). Of the 11 species here described and illustrated 10 are new.

'XX.—The Mollusk Fauna of the Pribilof Islands,' by William H. Dall (pp. 539-546, with a map). This consists of several pages on the general character and relations of the fauna, followed by tabular summaries for (1) the Pribilof Islands (86 species); (2) the Commander Islands (74 species), and (3) fossil species, from both groups of islands.

'XXI.—List of Insects hitherto known from the Pribilof Islands' (pp. 547-554), compiled by E. A. Schwarz.

'XXII.—List of Crustacea known to occur on and near the Pribilof Islands' (pp. 555-557), by Mary J. Rathbun.

'XXIII.—A List of the Plants of Pribilof Islands, Bering Sea, with Notes on their Distribution' (pp. 559-587, pls. lxxxvii.-xciv.), by James M. Macoun.

'XXIV.—Algæ of the Pribilof Islands' (pp. 589-596, pl. xcv.), by William A. Setchell, Ph.D. An index of 32 pages concludes the volume.

Part 4, relating to (A), 'The Asiatic Fur Seal Islands and Fur Seal Industry,' and (B) 'The Kuril Fur Seal Islands and the Fur Seal Industry of Japan,' is by Dr. Stejneger. The first, he tells us, is based on "observations gathered during four different visits to the Commander Islands, off the coast of Kamchatka, the first undertaken in 1882-83, in the palmiest days of the fur seal industry; the second during 1895, as a special attaché of the United States Fish Commission, to study the recent decline and to compare the conditions as I knew them thirteen years ago, with those of the present day. My third trip took place in 1896, by direction of the President, pursuant to the joint resolution of Congress approved June 18, 1896, and the fourth one in 1897, under the same auspices." It is thus obvious that the investigation of the Russian Fur Seal Islands was placed in exceptionally competent hands, and the results of Dr. Stejneger's investigations of fur seal life in Russian waters has not only a most important bearing on the general subject of the fur seal industry in northern waters, but also upon that of the Pribilof Islands. The decline in the fur seal herds at the Commander and Robben Islands has been as marked in recent years as has that of the Pribilof herd, due, beyond question, to the same cause—pelagic sealing. Dr. Stejneger gives first an account of the topography and climate of the Commander Islands, with a sketch of its fauna and flora, and the native inhabitants, and an account of the number, location and extent of the seal rookeries on both the Commander and the Robben Islands. Then follows 'Seal Life on Commander Islands' (pp. 82-113); 'The Russian Sealing Industry' (pp. 114-216); 'A Comparative Study of the Conditions of the

Sealing Industry on the Pribilof and Commander Islands' (pp. 217-228), with 'Conclusions' and 'Bibliography' (pp. 229-236). As Dr. Stejneger was also familiar with the fur seal life of the Pribilof group, he was especially fitted for the comparative study of the conditions found in the Russian waters.

The Kuril Islands are treated upon the same general plan as the Commander Islands; and although the Doctor's stay was here comparatively brief, it was practically a virgin field for such an investigation, his report giving us almost the first available information concerning not only the seal life but the general natural history of this group of barren, little known islands.

These four volumes of the 'Report of Fur Seal Investigations' are thus by no means confined to the fur seals themselves, or to questions in dispute as to the cause and extent of the decline of the herds and their proper future management, but is broadened to include the history and natural history of the Pribilof and other islands involved in the inquiry, as incidental and pertinent to the general subject. There hence results as the work of the Commission, first, a most thorough and judicial report on the 'fur seal question,' in its broadest sense, and secondly and incidentally, a most welcome contribution to the zoology and botany of the islands in Bering Sea and adjacent waters, all highly creditable to the Commission and its co-workers.

J. A. ALLEN.

A Theory of Reality. By GEORGE T. LADD. An Essay in Metaphysical System upon the Basis of Human Cognitive Experience. New York, Charles Scribner's Sons. 1899. 8vo. 556 pages.

The present volume is the culmination of the author's studies and discussions of certain problems, already defined and treated from other points of view in his *Elements of Physiological Psychology*, published in 1887, *Psychology, Descriptive and Explanatory*, of 1894; *Philosophy of Mind*, 1895; and *Philosophy of Knowledge*, 1897. The central thought in this whole philosophy appears to be the adoption of Self as the model and measure of reality. This

is expressed in the following passages: "For in our view, the one fundamental reality, the actual Being whose characteristics are recognized by the categories, whose work is both nature considered as the system of material things and also all the spirits of men considered in their historical development, is the Absolute Self. And the innermost essence of such an Absolute Self is Spirit. From Spirit, then, come nature and all spirits; and in dependence on this Spirit they live and develop. And the proof of this view lies in the fact that to rely on nature as a unifying principle it is necessary to include in our conception of nature the characteristics of a spiritual life." (Pp. 458 and 459.) Again, "The different spheres of reality as known by man are distinguished by the amounts of essential selfhood which they possess." (P. 401.) Again, "for every knower there are only two possible kinds of objects, which can claim for their reality the immediacy of an incontestable knowledge; these are the Self, and Things. As the knowledge of the self changes and develops the more external and less central factors of this object—the members of the body as viewed from the outside and even the brain as imagined or thought—become, for the Self, other things than itself. Always the primary evidence for the existence and the activity of all other selves is the knowledge of things; for each Self, every other being—other men included—is known as 'a Thing.'" (Pp. 348 and 349.) "Psychologically considered, then, all actual measurement of real quantities consists in the self-appreciation of the varying amounts of the own-life of the Self." (P. 301.) These quotations will indicate the author's metaphysical point of view.

Readers of SCIENCE will be more interested in the attempts of the author to define the various forms in which the mind conceives real things, which are the subject matters of science. It is the founding of a metaphysical theory of reality upon knowledge of particular, concrete things that distinguishes this treatise from what may be called purely metaphysical books. The author states that, "Whatever the human mind may know, or conjecture, about the Unity of Reality, about the One, the Absolute, the World-Ground—or any other term philosophers have

chosen for this unitary conception—man's firsthand, verifiable, and common knowledge is the knowledge of particular existence. For every human mind knowledge is, and remains, knowledge of the self and of other concrete beings—their qualities, relations, and transactions. From this knowledge of particulars all theory of reality must set out; to this knowledge all theory must be ready to return, for its correction and its testing, again and yet again." (P. 133.)

The scope of the book, as a theory of reality, is concisely described by the author at the close of Chapter IV., as follows: "The detailed exposition of such a theory * * * involves the discussion and illustration of the following fundamental truths. Each of them is a truth which has its roots in the primitive facts and in the maturer growths of knowledge, but which is also ontological in its nature and application. First: All the categories are forms, both of knowledge and of being, that are actually and indubitably realized in all our cognitive experience with the Self. I am a Being whose existence and whose self-knowledge is constituted a Unity, because I am a self-conscious Self. Second: All the real beings which are known as Things, together with their attributes, changes, relations, laws, etc., are made actual in our cognitive experience only as there is projected into them, so to speak, the same forms of Being which I know the Self to have. The categories, so far as they can get any recognizable meaning in their application to actual things, are the same categories as those under which we know the Being of the Self. Third: The Unity in a world of reality which all things and all minds have is known in terms of an all-inclusive and Absolute Self. Only the conception of 'Selfhood' can bring into actual and cognizable Unity that complex of concrete realities which both the work-a-day and the scientific experience of the race contains. And this unifying conception is properly held by the mind, not as a mere conception, but as the ultimate form given by reflective thinking to our knowledge of Reality." (Pp. 109 and 110.)

The discussion of the conceptions of 'force and causation,' 'forms and laws,' 'matter,' and the distinction between 'nature and spirit,' are

full of suggestive thoughts for physicists, chemists and biologists, who are too apt to overlook the many metaphysical conceptions used by them in their most rigid scientific investigations.

On the other hand, the scientist or the 'plain man,' accustomed to use trans-subjective things as his models of reality, is tempted to say that the 'reality,' with which Professor Ladd deals, is only a metaphysical abstraction, quite of a kind with the 'stream of consciousness' conception of the Self, which is adopted as his model. If a 'stream of consciousness' had no channel in the bed-rock of real things to flow in, such a man might ask, How could any knowledge of the reality of the Self arise? From a common sense point of view, such a criticism would appear to be valid, since our idea of, as well as our term for, reality is obtained from the thing (Latin, *res*). The thingness of the thing is reality; this does not, however, invalidate the theory that the 'ground of things' may be, metaphysically, in the same class with the Self. The 'plain man' will, however, contend that it is by reason of its derivation from the thing, as its ground, that the conception of reality derives its meaning, and he will naturally infer that the putting of reality and the self into the same class will reduce self to a ground of a particular trans-subjective thing, viz., of its physical organism. Only when we take the point of view of the author, by adopting self in contrast to thing as our model of reality, do we reach the conclusion that reality is the selfness of the thing and of all things. This volume is of chief value to the scientific student for the light it throws, from this view point, upon some of his most difficult problems.

HENRY S. WILLIAMS.

NEW HAVEN, CONN., November, 1899.

DETERMINATION OF THE DENSITY OF WATER
AT 4° C. BY THE INTERNATIONAL
BUREAU OF WEIGHTS AND
MEASURES, 1899.

THE interest attaching to the recent Report* on this subject is two-fold in that this constant

* Détermination de la masse du décimètre cube d'eau. Rapport préliminaire présenté au Comité International des Poids et Mesures dans la séance du 18 avril, 1899, par M. le Dr. Ch.-Ed. Guillaume.

is the connecting link between the metric units of capacity and mass as well as in most scientific volumetric measurements, and in that the present result bears the hall-mark of the institution that has given us our accurate standards of length, mass, and temperature. That the investigation was conducted by M. Guillaume, whose rare ability in quantitative research has become widely recognized through his memoirs as adjunct of the Bureau and through his admirable 'Thermométrie de Précision,' 'Unités et Étalons,' etc., is abundant guarantee that no refinement known to modern metrology has been omitted in this work.

After a discussion of the method, results, and sources of error, the report concludes:

"For the present it is probable that in adopting for the specific mass of water the value 0.99 995 or 0.99 996 the error committed will not exceed 2 centigrammes per kilogramme. We hope to be able by an exhaustive discussion of the measurements to reduce a little more these limits of uncertainty." (Translation.)

The method was the familiar one of weighing a solid of measured dimensions successively in air and in pure water from which the dissolved air had been withdrawn. Four hollow cylinders were used, two of bronze and two of brass. Their diameters ranged from 14.4 to 6.6 centimeters, and the height of each was about the same as the diameter. The corresponding weights of water displaced ranged from about 2 to 0.2 kilogrammes. The mean temperatures of the water when the weighings were made were about 8°, 8.°5, 9°, and 15°, these being selected, except the last, as giving about the maximum weight of displaced water. The linear dimensions of the cylinders were measured at a large number of systematically distributed points by the usual comparator. Sliding contact bars bearing reference marks were brought into contact with the cylinder at opposite ends of a diameter or of a height, and the distance between the marks measured by the microscopes and standard scale. This distance, less that found when the stops were in direct contact, gave the desired dimension. The density of the water was reduced to 4° by means of the tables of the expansion of water from the measurements of M. Chappuis (See *Procès-*