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PROF. GIGLIOLI'S COLLECTION ILLUSTRATING THE STONE AGE.

*Materiali per lo Studio della "Età della Pietra" dai tempi preistorici all'epoca attuale. Origine e sviluppo della mia collezione.* By Enrico Hillyer Giglioli. Pp. 248. (Florence: S. Landi, 1901.)

THE publication of a detailed description of the private collection formed by Prof. Enrico Giglioli is a welcome and important event, and one to which students of archæology and ethnology have long looked forward. Even to those who have not enjoyed the privilege of visiting Prof. Giglioli at home and seeing his treasures, it has been known by many indications that a scientific collection of no ordinary calibre was being brought together by the energetic professor. The actual wealth of material accumulated, as revealed by the present publication, is, however, somewhat startling, and one can but admire the perseverance and success with which he has pursued his hobby. One must refer to his studies and investigations in the fields of archæology and ethnology as a *hobby*, since Prof. Giglioli is a zoologist by profession, his official time being occupied in his professorial duties and his work as director of the important Zoological Museum in Florence. His private collection and the studies connected with it are the results of his leisure time labours, and one may readily infer that he has never indulged in that doubtful luxury "an idle moment." "Chi vive lavorando non ha mai tempo abbastanza," he laments, but he has utilised his available time to the utmost, by methodically devoting his day-time to zoology and his evenings to his collection. In the formation of his very extensive collection, he has kept always in view the definite object with which in 1883 he commenced to collect. His primary aim has been throughout to elucidate so far as possible the "Age of Stone" by means of comparative study; and to this end it has been his endeavour to secure as complete a collection as possible of objects illustrating, not only the life and arts of prehistoric Stone-age man in all countries, but also the conditions of culture of recent savage and barbaric races, whose developmental progress has from various causes been arrested or retarded, and who, therefore, may be regarded as *survivals* from various early stages in the general development of the human race. The bringing together of archæological and ethnological material into close association for purposes of scientific study, to the end that the specimens in the one class may serve to elucidate those in the other, has now long been recognised as of the greatest scientific value. Colonel Lane Fox and Mr. Blackmore were early pioneers in this field of inquiry, and the lessons which they taught still hold good and are increasingly appreciated.

Prof. Giglioli's publication is primarily a descriptive guide to his private collection, drawn up methodically under geographical headings and subheadings. The work is, however, more than a mere detailed catalogue, as its scientific value is enhanced by a running commentary of considerable interest to the archæological and ethnological student. While approving the general form and scope of

the work, one cannot but note one serious defect, tending greatly to reduce the utility of this otherwise valuable guide. There is no index to contents. A work of this nature should certainly be furnished with a good index; it should, in fact, be doubly indexed, on the one hand under geographical, and on the other under subject headings. The labour of producing the index would be well repaid by the appreciation with which this important feature would be received, and we may still hope that the author will issue an index in full which may be bound up with the work. There are several very fair illustrations in the text. It would be impossible within the limits of a short notice to give an idea of the richness of this collection. Many of the rarer objects are represented by good series, as, for instance, the New Zealand *hei tiki*, of which there are ten of nephrite, one, perhaps unique, of diorite, and others of bone. There are no fewer than 177 *toki* or stone adzes from the same region. Witness also the remarkable series of hafted stone axes from South America and the thirty-two ceremonial adzes with elaborately carved handles from Mangaia. Among the less rare forms, the numbers run high, and there are no less than 325 stone adzes and chisels from the New Guinea region. Both the art of war and the arts and industries of peace are well illustrated. Many of the uncommon localities which are included in the very comprehensive list of carefully localised specimens are but very rarely represented in even the more important museums, a fact which would of itself place this collection in the front rank. In his descriptions, Prof. Giglioli has given brief notes upon the races and tribes dealt with their geographical position, &c. Wherever possible, he has given the native names of the objects, and details as to manufacture and other points of interest are touched upon, rendering the work (especially if indexed) a valuable book of reference to ethnologists and collectors.

One may readily endorse the hopes expressed by the maker of this remarkable collection that it may eventually find a permanent home in a public museum and be preserved in its entirety. It would be almost a crime to allow the dispersal of a collection so complete and so systematically and laboriously brought together.

EXPLOSION MOTORS.

*Les Moteurs à Explosion.* By G. Moreau. Pp. xii + 444. (Paris: Libraire Polytechnique, Ch. Béranger, 1900.)

*Théorie des Moteurs à Gas.* By G. Moreau. Pp. 224. (Paris: Ch. Béranger, 1902.)

THE extraordinary developments which have attended the application of explosion engines to motor vehicles, and the rapidity with which the constructors of these light and powerful engines have carried their designs well within measure of practical perfection, forms one of the most noteworthy achievements of modern engineering.

The time has, however, arrived when practice must be tempered with a sound knowledge of theory, in order that further advances along the existing lines of construction may be achieved.

With this object in view, M. Moreau has compiled two

volumes in which the theory of explosion motors and the nature of the combustibles used therein are detailed in a thoroughly clear and systematic manner. The two volumes cover to a certain extent identical ground, but in the earlier work the subject is treated in its widest sense and the mechanical features of the motor vehicle as a whole are freely investigated; while in the later work the author confines himself exclusively to the engine, and here brings the theory of the subject well into line with the latest developments in practice, at the same time indicating the directions in which further improvements may be arrived at.

In the earlier work, the opening chapter is devoted to purely theoretical considerations of motors operating with perfect gases, and the laws regulating the behaviour of such gases under varying conditions of pressure and temperature. The imperfections of the gases actually available in practice are then considered, and the working conditions of the various cycles which may be employed are investigated. A chapter is devoted to the question of the specific heats of gases under various conditions, the question of the rate of the explosion relative to piston velocity, and the losses in actual engines due to throttling at the inlet and exhaust, to the cooling of the cylinder walls and to heat rejected on exhaust; representative diagrams are given and the total losses discussed.

Three chapters are then devoted to questions connected with the mechanical design of engines and motor vehicles, such points as the movements of the piston, connecting rod and crank-pin, valve movements, frictional losses and the strength of materials being fully discussed. All the chief organs of the transmission gear and special items such as axles, wheels, brakes, pneumatic tyres, carburettors and ignition apparatus are dealt with in detail, the author carrying his investigations in this portion of the work far beyond the limits indicated by its title. The nature and properties of the various combustibles which are available for explosion motors are next fully considered, the author remarking with much truth on the extraordinary ignorance amongst constructors on this particular branch of the subject. The work concludes with a comparison of trials of motors and automobiles, and considerations relative to the most suitable cycle to employ, the author advocating a six-stroke cycle—namely, admission, compression, expansion, recompression, explosion, exhaust—the advantages gained being a better mixture, re-heating of the charge after it has entered the cylinder, and abstraction of heat from the walls, which would diminish the loss to the cooling water.

In the more recent volume, which is based on a series of lectures delivered before the Automobile Club of France, the functions of every type of explosion engine which may be employed on a motor vehicle are investigated in a systematic manner. All the most important points in the design of engines, such as the volume of the compression chamber relative to the total cylinder volume, the influence of the walls, of the periods of admission and exhaust, and of the propagation of the explosion are carefully considered.

The concluding chapter, which forms nearly one-third of the volume, is devoted to the nature of the combustibles which may be employed, to the best conditions for the

running of an engine and to investigations of the inertia of the reciprocating parts.

The subject in both volumes is handled in the clearest possible manner, and although higher mathematics is freely employed in every investigation, each step is so carefully traced that the author may be followed to his conclusions by all who possess a practical knowledge of the subject of explosion engines.

C. R. D'ESTERRE.

#### MARIGNAC AND HIS WORK.

*Œuvres complètes de Jean-Charles Galissard de Marignac.*  
By E. Ador. Tome i., 1840-1860. Pp. lv + 701.  
(Genève: Eggimann, n.d.)

THIS edition of the works of Marignac is prefaced by a biographical sketch by his son-in-law, Prof. Ador. From this sketch, we learn that Marignac, a native of Geneva, came of a scientific stock; at the house of his uncle, Le Royer, he early made the acquaintance of distinguished men, of whom there has been no lack in his native town. Prévost, De Candolle and Dumas were frequent guests in Le Royer's pharmacy, and from them young Marignac imbibed that single-hearted devotion to science which so strongly characterised him. He began his career, not as a chemist, but as an engineer; he was a pupil of the École Polytechnique, and later of the École des Mines, at Paris. His talents had so strongly impressed the French authorities, however, that long after he had ceased to be connected with France and had accepted his chair at Geneva, the French Government expressly granted to him the right to keep the title "Ingénieur des Mines," in spite of his having ceased to be a French subject.

In 1840, when twenty-three years of age, he came under the magnetic attraction of Liebig and passed a semester at Giessen; and it bears high testimony to Marignac's genius to find that after that short probation he was offered, and accepted, the much-coveted post of chemist to the porcelain factory at Sèvres. He occupied the position only six months, and on receiving a call to fill the chair of chemistry in the Academy of Geneva (for the University had not at that time been created), he at once accepted, finding his life work in an academic career. As professor there, he lived and died, although in 1878 he withdrew from active teaching. Never robust, he succumbed gradually to an insidious disease, and he died in 1894, after a long and tedious illness, borne with the utmost fortitude. His lectures were models of method and clearness—indeed, these were the characteristic features of all his work—and his modesty, patience and perfect conscientiousness gained for him the esteem of the whole scientific world, testified by the numerous honours which fell to his lot.

His only researches in the domain of organic chemistry, no doubt suggested while in Liebig's laboratory, dealt with phthalic acid and the action of nitric acid on naphthalene. It was at Geneva that he began the series of investigations on atomic weights which have rendered his name famous. The inducement was to test Prout's law; and the ratio between the atomic weights of chlorine, potassium and silver first occupied his attention. His attempts to prepare pure material for experiment