

in a concise, and not too technical a form, the leading characteristics and details of modern road construction, and the results of the traffic to which these roads are subject. The relative merits of macadam, granite sets, asphalt, and wood paving are fully dealt with.

The author considers that macadam on a good foundation, for horse-drawn vehicles, is the best, and the condition of these roads is greatly improved, both as to cleanliness and endurance, when the surface is sprayed with tar; that creosoted soft wood, such as red pine or yellow deal, gives more satisfactory results for urban traffic as regards wear than the harder woods, such as oak or jarrah; that wood paving has the advantage of being silent and not slippery; and that for motor traffic asphalt paving is the best. The relative endurance, and the time the surface will last without replacing, is given as two years for macadam laid on a good foundation; for soft creosoted wood paving laid on concrete, fifteen years; and for rock asphalt on concrete, twenty years.

Statistics are given showing the great advantage that is derived from the use of tar for spraying macadam roads, both in the prevention of dust and by increasing the length of the life of such roads, which the author calculates at 33 per cent. It is also shown that the use of motor vehicles reduces considerably the amount of refuse that has to be removed from the surface of the roads.

The book contains eleven chapters dealing with a general introduction on modern road construction; macadam roads; wear of roads; effect of traffic; tarring macadam roads; methods of using tar and bitumen; rollers and rolling; paving; cost of maintenance of roads; with appendices giving a specification for road-making; wood paving; tarring; and copies of the Road Board specification for pitch.

HISTORICAL GEODESY.

Grandeur et Figure de la Terre. By J. B. J. Delambre. Ouvrage augmenté de notes, de cartes, et publié par les soins de G. Bigourdan. Pp. viii + 402. (Paris: Gauthier-Villars, 1912.) Price 15 francs.

LES conquêtes passent, et ces opérations restent," was the compliment with which Napoleon accepted from Delambre a copy of his "Base du Système métrique décimal." The publication of this work of the great French geodesist offers a good reason why the second half of the above remark was as true as the first. The manuscript which Delambre left unpublished at his death gave an interesting his-

torical account of the pioneer work of the eighteenth century in investigating the size and shape of the earth, and it also reveals the value of his own share in that work. Names well known outside the world of astronomy appear in the book: Colbert gave the first order for a measure of an arc along the meridian of Paris; Robespierre signed a document expelling Lavoisier, Laplace, Coulomb, and Delambre, with others, from the Commission des Poids et Mesures. Many other French names also occur in the book to remind the world how much geodesy owed in its earliest stages to the Académie des Sciences.

The direct effect on contemporary scientific work of such a tremendous upheaval as the French Revolution is well shown in Delambre's account of the delays caused by his repeated arrests at the hands of ignorant provincials. One is tempted to wonder whether, if the metric system had been established at a time when more friendly relations existed between France and England, this country would also have adopted it. M. de Talleyrand's invitation to the British Parliament to appoint a commission of Fellows of the Royal Society to cooperate with members of l'Académie des Sciences in fixing natural and invariable units of weight and length, is still of more than academic interest.

Enough has been said of the historical side of this book. It must now be added that Delambre's accounts of the surveys of arcs in the different parts of the world are marked by very close study of all available sources of information. Where possible, the original manuscripts were studied, and by very acute criticism the faults of much of the earlier work and some of the later work were elucidated. Several investigators, notably J. Cassini, come in for pretty severe treatment; Delambre's critical remarks may still be most useful to warn the young observer as to faults to be avoided. The accounts of the journeys of some of the surveying parties are very interesting, in particular the journal of the Abbé Outhier on the Lapland survey of 1736. Curiously interesting, too, it is to see new items of knowledge gradually entering in as factors in elucidating the problem under discussion. Thus the first emergence of spherical trigonometry and the modification of results owing to the discovery of nutation, come upon the present-day reader with a curious sense of shock.

A debt of gratitude is owing to M. Bigourdan for his work in editing the manuscript. We note only one misprint; Groombridge is spelt wrongly on p. 314. The successful way in which the editing has been done may be taken as a sign of the pleasure that M. Bigourdan has felt in carrying through the undertaking.