DISPLACEMENTS OF SOLAR LINES.—In continuation of previous work on iron, Dr. Royds has recently made an extensive series of comparisons of the spectra of the sun and arc for nickel and titanium, and has also investigated the displacements at the negative pole of the arc in the case of these elements (Kodaikanal Bulletin, No. 51). Unsymmetrical lines of nickel and titanium, as indicated by their behaviour at the negative pole, and by records of their appearance under pressure, were found to be very numerous, and it was only possible to confirm to a limited extent the conclusions arrived at from the lines of iron. It is considered, however, that the new results are not inconsistent with the conclusions deduced from iron by Mr. Evershed, namely, that the displacements at the centre of the sun's disc, and at the sun's limb, are Doppler effects due to descending motion in the line of sight, and that the solar pressure is of the order of three-quarters of an atmosphere. The spectrograph employed in these investigations has been provided with a new Anderson grating having 75,085 lines on a ruled surface of 9·7×12·8 cm.

THE PROBLEM OF SPIRAL NEBULÆ.—The view that spiral nebulæ may be distant galaxies, or "island-universes," is discussed in an interesting article by Dr. Crommelin in the May number of *Scientia*. In recent years this hypothesis has received considerable support from the discovery that a large proportion of the non-gaseous nebulæ are of spiral form, and by the accumulation of evidence that our own system has a somewhat similar structure. One of the chief difficulties with regard to it is the fact that such nebulæ are mainly concentrated in the vicinity of the galactic poles, thus suggesting a connection with our system, but Dr. Crommelin considers that this apparent avoidance of the galactic plane by the spirals may be explained by assuming the existence of patches of obscuring matter which become more numerous as the galactic plane is approached. Moreover, if the spirals were inside our system, their grouping would probably be about an axis through the centre of the galaxy, and not about an axis through our sun at right angles to the galactic plane. The alternative view that the spirals may be emanations driven out of our system by some agency seems to be rendered untenable by the recently discovered fact that their radial velocities are greatly in excess of any velocities which have been observed within the system. Dr. Crommelin concludes that most of the evidence seems to favour the extra-galactic position of the spirals, and if this view be adopted, it follows that they are of dimensions comparable with those of our galaxy. They are probably at a comparatively early stage of development, much of their matter being still scattered and diffused in clouds which reflect some of the starlight.

ELIAS ASHMOLE, F.R.S., FOUNDER OF THE FIRST PUBLIC MUSEUM OF NATURAL HISTORY.

MAY 23 next will be the three hundredth anniversary of the birth of Ashmole, antiquary, herald, and man of science. He included among his interests not only the entire world of Nature, but, like some physicists of the present day, he delighted to explore the regions of the preternatural. He has often been blamed, and we think unjustly, for devoting so much time to astrology and alchemy, which were the "scientific" pursuits in fashion at that period; but we should dwell upon what has lasted of his work rather than upon what was trivial and ephemeral. So far as science is concerned, the outcome of his lifework will always be memorable, for he became the founder of the first public museum of natural history in Great Britain; next, he must be regarded as the founder of the first university chemical laboratory; and, thirdly, he founded the first chair of chemistry in Oxford.

Ashmole was born at Lichfield, and received his early education at the local Grammar School. At the age of twenty-seven circumstances brought him, in the character of a commissioner of excise, to Oxford, where he continued his education in physics and mathematics as a member of Brasenose College, and imbibed from a Capt. George Wharton that taste for the study of astrology and alchemy which led him to give these subjects so much of his time. In October, 1646, he moved to London, and there for the next ten years eagerly assimilated the experimental facts and visionary lore of Lilly, Booker, and Martin Backhouse. He vigorously pushed forward his studies in astrology, chemistry, and botany; was a guest at "the mathematical feast at the White Hart"; edited Dr. Dee's writings; published the "Theatrum Chemicum," and, to quote Selden, "was affected to the furtherance of all good learning."

Ashmole lacked the touchstone of modern training which renders a student competent to discriminate between false and true learning; it was beyond the power of any one man to investigate every recipe for the philosopher's stone, and discover for himself the futility of this and similar quests. But during those years of research in London Ashmole arrived at the best method of stimulating interest in scientific matters, knowledge which was put to the best use some years later. We will not therefore regard him as a scientific observer nor as a successful experimentalist, but as the promoter of one of the most effective methods of primary scientific education, which aims at awakening and developing the intellectual activity of the young by putting before their eyes remarkable objects of natural history. Prof. Tyndall well expresses the essentials of the method in his address on "The Importance of the Study of Physics as a Branch of Education for all Classes"; he points out the great value of the incentive that the exhibition of natural objects and phenomena supplies in the stimulating of mental activity:—"As the nurse holds her glittering toy before the infant she would encourage to take its first step, so it would appear as if one of the ends of the Creator, in setting those shining things in heaven, was to woo the attention and excite the intellectual activity of His earth-born child." Without going so far as the distinguished physicist, in attributing motives to the Creator, we would insist that the more strongly the senses of the observer can be arrested by objects or phenomena of curious or unusual nature, the more vivid are the images of thought which are conjured up in the mind. When objects become commonplace, or operations a part of our everyday life, they lose this power of stimulation. Impressions arising from accidental circumstances often exercise so powerful an effect on the young as to determine the direction of a career. Humboldt relates that his early desire to visit tropical countries sprang partly from seeing some pictures of the shores of the Ganges in the house of Warren Hastings in London, and from the sight of a colossal dragon-tree in the old tower of a botanic garden. To a mind susceptible to impressions of this kind such object-lessons have the greatest educational value. And it is for this reason that Ashmole, as the founder of the first public museum of natural history, has the greatest claim to our consideration.

The oldest specimens in his museum had been collected by John Tradescant the elder (died 1638) during his travels in Holland, Russia, and Barbary, about the end of the sixteenth century. He left the collection to his son John (died 1662), who enriched it by adding new specimens collected on his travels in Virginia,

and, under the persuasion of Ashmole, published a catalogue of the whole collection. Although this catalogue appeared under Tradescant's name, allusions in the preface and the more definite statement of John Evelyn, "printed in his catalogue by Mr. Ashmole," make it almost certain that Ashmole was not only the instigator but also part compiler and editor of this, the first English, catalogue of a natural history museum. The keen interest Ashmole took in the collections would explain why Tradescant should have drawn up a deed of gift in 1659 making over the whole cabinet of rarities at his death to his friend, who, in 1674, after twelve years of controversy and litigation with the widow, moved the collections to his house in South Lambeth, where they were so carefully and methodically preserved as to elicit praise from Izaak Walton.

In 1677 Ashmole offered the whole collection, with the additions he had made to it, to the University of Oxford, on condition that a suitable building was provided for their display. His offer was accepted, a museum was built, the rarities were "put up in cases," and on March 14, 1683, the last loads "were sent to the barge" for transport to Oxford, and Ashmole "relapsed into the gout."

The preamble to his statutes, orders, and rules for the governance of his museum shows clearly that his intention was to provide the University with a museum of natural history, which should be primarily a scientific institution and not a "knick-knackatory," or a collection of historical relics and antiquities, such as has now come to be exclusively associated with his name at the New Ashmolean Museum, of which Sir Arthur Evans was the practical founder. The advancement of natural knowledge was Ashmole's first object; the accumulation of objects of art was not his purpose except in so far as those art objects served to illustrate the application of natural products. The preamble runs as follows:—

"Because the knowledge of Nature is very necessarie to humaine life, health, and the conveniences thereof, and because that knowledge cannot be soe well and usefully attain'd, except the history of Nature be knowne and considered; and to this is requisite the inspection of particulars, especially those as are extraordinary in their Fabrick, or usefull in Medicine, or applyed to Manufacture or Trade: I, Elias Ashmole, out of my affection to this sort of Learning, wherein myselfe have taken, and still doe take, the greatest delight; for wch cause also, I have amass'd together great variety of naturall Concretes and Bodies, and bestowed them on the University of Oxford, wherein my selfe have been a student, and of which I have the honor to be a Member. Lest there should be any misconstruction of my intendment, or deteriorating of my donation, I have thought good, according to the Acts of Convocation, bearing date Jun: 4: Aº 1683 and Sept: 19: Anº 1684, to appoint, constitute, and ordaine as follows." Then follow eighteen orders.

Order 6 is an example of his judicious foresight. It enacts "That whatsoever naturall Body that is very rare, whether Birds Insects, Fishes, or the like, apt to putrefie and decaye with tyme shall be painted in a faire Velom Folio Booke, either with water-colors, or at least design'd in black and white, by some good Master, with reference to the description of the Body itselfe, and the Mention of the Donor in the Catalogue; wch Booke shall be in the Custody of the Keeper of the Musaeum under Lock and key."

In these days of cheap photography the execution of this order would be a simple matter. Order 7 provides for the exchange or donation of duplicates, and by Order 8 old specimens are to be removed to cupboards.

The new building was constructed so as to include a lecture-room and a chemical laboratory, and for more than a century and a half it was the centre of scientific life in Oxford. For the further advancement of science Ashmole founded the first chair of chemistry in Oxford, and Robert Plot was appointed first Ashmolean professor, and also keeper to the museum. Unfortunately the founder's schemes for the adequate advancement of his favourite subjects were longer than his purse, and he did not live long enough to collect sufficient capital endowment to put the new professorship upon a permanent footing.

Ashmole is not likely to be forgotten in Oxford, yet the destiny that so often militates against just recognition in science has brought it about that his name, the museum and officers he created, are no longer used in accordance with his original ordinances. The museum in which he took so much pride no longer exists as such; even the knick-knacks to which his name is attached can no longer be seen in the building which he persuaded the University to provide; the old Ashmolean building, sadly in need of repair, is degraded to class-rooms, offices, and book stores; the greater part of the scientific specimens which he so greatly valued have been destroyed, and the few fragments that remain distributed; and Ashmole's keeper, relieved of the duties that were put upon him by the founder in respect of the natural history collections, is now in charge solely of the few curiosities which did not in Ashmole's opinion constitute the central feature of his museum.

A fitting commemoration of his name is to lay stress upon the fact that he was one of the pioneers of scientific education in England, that he earnestly endeavoured to promote learning, and that it is only by an error that his name has survived as a collector of curious antiquities. Of the old Tradescant and Ashmole collection some score or two of zoological specimens have survived from the seventeenth century. It is to be hoped that they may once more be brought together in accordance with their donors' wishes and their great historic value.

R. T. GUNTHER.

PUBLIC SCHOOLS AND NATURE STUDY.

THE unusual interest attaching to the report of the Rugby School Natural History Society for the year 1916 warrants our directing attention to the great service which our public schools may render to the cause of natural science. It is the jubilee number, and in addition to the usual features contains much other matter of exceptional interest. Special mention may be made of the racy and valuable paper by Canon Wilson, of Worcester, in which his personal reminiscences of the early history of the society, and, indeed, of the prehistoric period, are set forth with much humour and enthusiasm.

Though the fiftieth anniversary of the founding of the society was celebrated in March last, thus carrying us back to the year 1867—the tercentenary of the school—yet we learn that work on similar lines to those which the society follows to-day was carried on for some years previously. The geological museum dates from the time of Dr. Arnold. Canon Wilson went to Rugby as a master in 1859, and found a large collection of dusty and unnamed specimens in the Arnold Library. But one goes back yet another decade, and finds the year 1849 specially worthy of note. It was then that Dr. Sharp, a resident medical man, gave the first lectures on natural philosophy. Rugby School thus proclaims itself, not abreast, but in advance, of public opinion in regard to the position which natural science ought to occupy in liberal education.