

much experimental work, the conditions under which the maximum production of ammonia may be obtained by the decomposition of coal; it need scarcely be said that the subject is one of the greatest importance, having regard both to the great manurial value of the product for agricultural purposes and to the highly important part that it plays in the economics of coal carbonisation. The lecture concludes with a brief review of the present position of the synthetic processes for the production of ammonia, the chief protagonists being the Haber and the Claude processes; Prof. Cobb evidently holds the view that there is likely to be but little to choose between the costs of production of ammonia from coal and by synthetic methods, and that it is to-day impossible to say on which side the advantage will ultimately rest.

While each of the lectures is a complete little monograph in itself, the subjects have been carefully selected, so that the book as a whole covers well a large portion of the field included under the comprehensive title of the Utilisation of Coal, a subject which is of the greatest national importance at the present moment. It has often been said that British coal has been too cheap in the past, and that we accordingly got accustomed to squandering recklessly our greatest national asset; such habits of extravagance, once acquired, are not easily got rid of, but works like the one before us have at least the great merit of indicating the right road to a much-needed improvement in this respect.

H. LOUIS.

Astrology of Comets.

Tychonis Brahe Dani: Opera Omnia. Edidit I. L. E. Dreyer. Tomus iv. Pp. 377-524. (Hauniae: Libraria Gyldendaliana, 1922.)

IN these pages Dr. Dreyer has given us an interesting collection of papers on comets, not hitherto accessible to the learned world. After the concluding page of the well-known "De Mundi Ætherei recentioribus Phaenomenis" we have a treatise of sixteen pages in German, now printed for the first time, on the comet of 1577. Next come nine pages in Latin on the comet of 1585, printed at Uraniborg in the "Diarium astrologicum et meteorologicum" of Elias Olai Cimber for 1586, and seven pages in the same language now first published on the same comet. These last two treatises are mainly astrological, as is no small part of the treatise on the comet of 1577.

The largest part of the present fasciculus is, however, occupied with a controversy on comets between Tycho Brahe and the Scottish physician John Craig. Tycho had sent Craig a copy of his printed but as yet

unpublished work, "De Mundi . . ." and Craig had replied in certain letters which as Dr. Dreyer informs us were published by Noltenius in 1737. These drew from Tycho an "Apologetica Responsio," filling sixty pages of the present volume. The work was printed and a few copies were sent to friends. It was Tycho's intention to include it along with the whole controversy with Craig as a supplement to his "De Mundi . . .," but his representatives wisely decided to let the main treatise go forth by itself. No printed copy of the "Apologetica Responsio" has survived, and Dr. Dreyer has edited it from a MS. at Copenhagen. Craig replied to this work in a treatise entitled "Capnuraniae restinctio," of which Dr. Dreyer has been able to give us a fragment from a Vienna MS. The task of replying to this work was ultimately undertaken by Kepler, but abandoned by him on Tycho's death, though Kepler's unfinished reply has since been published in his collected works. Dr. Dreyer's notes on the whole volume, including the "De Mundi . . .," occupy the last thirty-two pages of the present publication.

Not the least instructive of these studies are the astrological treatises. It will be observed that with the exception of the paper written for his assistant, Tycho early abandoned the intention of publishing them. In an age when nearly all science was based on an experience not supported by carefully recorded experiments and observations, it was reasonable to give to the supposed truths of astrology the same respect that was shown to scientific teaching generally. Tycho's astrology is neither fanciful nor arbitrary, but professes to regard observation as the test of truth. Thus on p. 413 he refuses to decide on the limits of the clima of Saturn, because they rest on no sufficiently attested experience. On the other hand, he regards it as a settled fact that the comet which was seen in Aries in 1533 changed the religion in Britain and caused lasting discord. Whatever value Tycho may have attached to such speculations, he could not but feel that they were work of a very different class from the great astronomical edifice founded on his own observations of precision.

The controversy with Craig is not without its analogies. Craig held with Aristotle that objects in the ether were immutable, while objects in the elements might suffer change, and that temporary phenomena like comets must, therefore, be sublunar. Tycho Brahe held that from the relative slowness of their motion and the absence of perceptible parallax they must be more distant than the moon. The question is of the ever recurrent type where observations seem to conflict with a general principle which has hitherto known no exception.