also of the sheaf form, which I have seen in storms directly overhead, the flash being like two brushes discharging in opposite directions, recalling the classical representations of the lightning in the hand of Jupiter. ROBERT BRIDGES.

Yattendon, Newbury, November 8.

An Early Reference to Hydractinia?

IN Swammerdam's letter to Thevenot on the anatomy of the Hermit Crab, there seems to be a reference to Hydractinia. The passage ("Biblia Naturæ," Leyden, 1737, i. 197) runs thus:—"Maximas tamen omnes [conchas] *Fuci marini quædam species, punctis vel apicibus minutis assurgens*, obtegebat eousque; ut tota nonnullarum figura obscurata & deformata esset; neque spiralium, quibus gaudent, convolutionum ulla posset conspici."

I venture to suggest that the words in italics fairly (though, of course, not literally) correspond to the "chitinous crust covered with numerous grooved and serrated spines" of Hincks ("Brit. Hydroid Zoophytes," i. 23, 24). The obliteration by Hydractinia of the whorls of shells tenanted by the Hermit Crab is well-known. Specimens showing such obliteration may be seen in the Natural History Museum, South Kensington.

Harringay, N. HENRY SCHERREN.

Rooks and Walnuts.

MR. REID'S remarks on rooks carrying off acorns, suggests my mentioning that they are great depredators of my walnuts. They come early in the morning, attack the walnuts on the trees, and carry them off to an adjoining field, where they punch a hole in the shell and extract the contents.

They build on several groups of elms in Ealing, and on one row of trees close to Christ Church they come regularly at Christmas to see what repairs are required; but one tree, which has an electric wire running through it, they now entirely avoid.

GEORGE HENSLOW.

A Substitute for Sulphuretted Hydrogen.

HAS "Rusticus" (see vol. lii. p. 597) heard of liquefied H_2S? I have tried it, and find it works admirably. Unlike ammonium thio-acetate, it can be obtained from any of the usual chemical dealers; a bottle containing a pound, = 11 cubic feet, can be had for a few shillings. It is always on hand when required, and entirely dispenses with the old H_2S apparatus and its abominations. A very great desideratum is the purity of the liquefied gas. CHEMICUS.

A GERMAN IMPERIAL INSTITUTE.

IN his presidential address to the British Association at Ipswich, reported in NATURE on September 12, Sir Douglas Galton referred to the efforts made by the German Government and Municipalities to advance scientific knowledge and promote research. In his statement that the "Royal Technical High School" at Charlottenburg "casts into shade the facilities for education in the various Polytechnics which we are now establishing in London," he scarcely appreciates the radical distinction between the German and London institutions, which accidentally bear the same name, but which are wholly different in purpose and organisation. But his remarks on the Reichsanstalt of Berlin are so suggestive and so full of interest, that I was eager to have the opportunity of visiting the Institute, and was glad within the last week or so to be able, during a brief stay in Berlin, to make myself better acquainted with its work.

The Institute, as its name implies, is an "Imperial Institute," as distinguished from the Polytechnicum, which is under the Government of the Prussian State. The Polytechnicum, or Technical High School, has been already described in NATURE, and is one of a number of technical universities situated in the several States which compose the German Empire. The Berlin Institute at Charlottenburg is by far the largest and the most completely equipped in Europe, and is already pronounced too small for the ever-increasing number of students, now exceeding 3000. In close proximity to this building in the Marsch Strasse, a turning in the leading avenue through the Thiergarten, the Physical-Technical Imperial Institute is now being erected. When complete it will consist of three detached buildings, in addition to separate residences for the Director and for some members of his staff. Two of these buildings are already finished, but the third is not yet erected, and pending its completion the work of this section of the Institute is carried on in a portion of the basement of the Royal Polytechnic.

The work of the Institute consists of two separate, but in some respects associated, sections. Section I. is devoted to pure scientific research, and Section II. to the testing and standardising of different kinds of measuring instruments. The Research Department is already housed in the main building of the new Institute, which has been planned especially for the purpose; whilst much of the testing work of the other department is still carried on in the Polytechnic building. The united Institute is under the general direction of Dr. Kohlrausch, and is maintained at an annual cost to the Government of about £15,000.

The Research Department of this interesting Institute is housed in a three-storeyed building, consisting of a basement, a main floor, and an upper storey. The construction is in many respects peculiar. The walls, instead of resting on separate concrete foundations, are built into a concrete flooring two metres deep, which covers the entire area of the building, so that the walls, basement, and flooring are closely bound together. The effect of this is that the building, if it vibrates at all, must vibrate as a whole, and no one part is separated from another. There is consequently no need for the isolated pillars which are found in some of our English laboratories. But even this arrangement does not appear to be perfect, and although the building is well set back from the road, in which there is some traffic, vibratory movements are not entirely avoided. The principal floor of the building consists of a central room, used mainly for experiments requiring constant temperature, surrounded by a corridor which leads into a number of other laboratories for experiments in electricity, magnetism, light, and heat. There are various interesting arrangements for maintaining the constant temperature of the central room, including the admission of light from the top through a series of separated glass roofs. The experimental work of the first section, or "Abtheilung," is under the direction of three heads of departments, Drs. Thiesen, Jaeger and Lummer, who occupy themselves respectively with investigations in heat, electricity, and light. They are aided by a number of permanent assistants, and by other workers who are admitted into the Institute for the prosecution of some special investigation. The members of the staff are engaged entirely in research, and have no teaching duties. The researches of the staff during the past year comprise numerous investigations connected with the determination of the expansion of bodies under heat; experiments with different kinds of thermometers, and pyrometers; electric and magnetic investigations; and photographic and photometric experiments. Short notices of these researches, giving the results as ascertained, are annually published.

Section I. is occupied exclusively with the testing of different measuring instruments. The makers of thermometers, manometers, and pressure gauges of all sorts, send their instruments to the Institute to be tested. Galvanic elements, accumulators, arc lights, ammeters, electric condensors, resistance coils, &c., are being tested in different parts of the building. No measurements connected with weight or mass are undertaken, and the testing of the strength of materials for builders and engineers is carried on in other buildings in no way connected with the Institute. The number of thermometers alone sent to the

Institute to be tested amounted last year to 11,656, of which 10,005 were clinical thermometers. A small charge is made for work done for the trade, but the receipts from this source of revenue do not exceed £1000. Incidentally, in connection with this work, there is a large amount of original investigation, and the staff employed are all men of proved scientific ability. New methods for obtaining more correct results and greater accuracy in measurement are constantly being investigated, and to this extent Section II. is equally with Section I. a laboratory of research. The experiments in Section II., however, are all directed towards the more accurate testing of instruments of precision. Some of the work done in this section is undertaken at the request of the staff of the Research Laboratory, and in connection with the experiments in pure science.

This Imperial Institute is under the immediate control of a Curatorium or Council, consisting of Professors of the University and Polytechnic, of engineering and technical experts, and of heads of industrial firms, presided over by a member of the Government. The selection of members of the staff, and permission to work at the Institute, rest with the Council. At first, applicants for admission were required to have obtained their Doctor's degree; but no such rule now holds. The ability to work, and the intention of prosecuting some original investigation previously approved by the Council, is a sufficient qualification. Each application for admission is considered on its merits. The Physical-Technical Imperial Institute is the crown of the series of coordinated Institutions which afford facilities for technical instruction in physical science, and opportunities for advanced research. In the city of Berlin are well represented the various educational agencies which have contributed so largely to the greatness of Germany; and the improvements which have been made of late years in the lighting and sanitation, in the postal and telephone arrangements of Berlin, are so many practical indications of the value of the education which the State and the city jointly provide. The Physical Institute is literally a temple dedicated to science, and its two divisions correspond with the twofold character of all scientific work—that which is undertaken with the sole object of widening the area of knowledge, and that which enables knowledge to be applied to the useful purposes of life. PHILIP MAGNUS.

THE PLANET JUPITER.

THIS bright planet now rises more than two hours and a half before midnight, and as his northern declination is about 18½°, he attains an altitude of about 57° when southing at about 5h. 15m. a.m. His apparent equatorial diameter this evening (Nov. 14) will be nearly 40″·5, and is increasing daily, so that by the end of the year it will be 45″·6, when the planet will be visible nearly all night, and remain above the horizon during a period of 15½ hours. He will arrive at opposition to the sun on January 24, 1896, and will then be displayed under the best conditions.

To those, however, who are disposed to study the complex and variable features exhibited by the belts, the present is an important time, for it is advisable that such markings should be watched during long periods, and that a large number of their transits should be recorded. Their individual rotation periods may then be ascertained, and the differences determined, together with the fluctuations of speed affecting the same objects. Details of this character can only be correctly derived when the observations are numerous and extend, at least, over a fairly long period of time. Materials of the kind alluded to, obtained in the early part of the opposition, are of special value for comparison with the observations made at the time of opposition, and with the terminal ones which may be secured in the evenings of June 1896, just before the planet leaves us for a season.

The features of Jupiter, though liable to certain changes, are yet, in some of their leading characteristics, remarkably durable. Like the spots on the sun, many of the markings on the planet disappear and reappear under very similar aspects. In fact, we are not without evidence that a certain degree of periodicity regulates the visibility of certain spots on the disc. In 1870 there was an eruption of dark spots along a belt in about 25° north latitude. In 1880 the phenomena appear to have recurred, for the same belt became studded with black spots, and in 1891 similar appearances were repeated. These markings are remarkable, as possibly indicating a periodical recurrence at intervals of about ten or eleven years. But it may be gravely doubted whether, in the present state of our knowledge, the materials exist for suitably investigating the question as to cyclical changes in the Jovian spots. The individuality of observers must affect the matter to a considerable degree, as their drawings and descriptions of the same features are seldom in agreement.

In recent years, the great red spot has not been so much observed as formerly. It has lost its striking character and its novelty, and planetary students have somewhat neglected it for newer objects more readily within reach. During the last ten years the mean rotation period of the spot has been 9h. 55m. 41s.; but it has shown some irregular variations. The slackening motion of the spot which operated so perceptibly between 1879 and 1885, and added seven seconds to the rotation period, appears to have been checked in the latter year, and the rate has been pretty evenly maintained since that time.

As to the visible aspect of the spot, it is now extremely faint, and can only be discerned on a good night of definition. Its feeble outlines are generally lost amid the very dark and well-marked boundaries of the belts in its immediate vicinity. But on a good night it is seen as a pinkish discolouration of the bright zone outlying the great southern equatorial belt, though its beautiful oval outline is distinguished with difficulty.

One of the interesting features of recent oppositions of Jupiter has been the series of dark and white spots plentifully arranged along the northern side of the great northern equatorial belt. These markings move swifter than the red spot, but not much so, for their period is 9h. 55m. 35s., or only six seconds less. They show changes, for sometimes one may be seen exceedingly dark, if not absolutely black, and just like a satellite-shadow in transit; but in a week or two a great decadence of tone may have affected it, and it appears scarcely darker than the belt on which it lies. These markings, so prominently fringing the northern belt, have certainly been visible during the last ten years. In 1885 I found their motion about eight seconds swifter than that of the red spot, but there were irregularities. Different spots, though in the same longitude and, probably, of the same character, do not yield coincident times of rotation, nor does any one object maintain exactly the same rate during a long period of time. The current in which they are situated, and by which they are transported to different longitudes, evidently suffers inequalities of speed, which are probably due to local disturbances underlying it.

These features of the northern belt are still very pronounced. On the morning of September 27, I observed two very dark spots projecting north from the belt and preceding the red spot at intervals of about four and two hours. The red spot follows Mr. Marth's zero meridian (System II.) by about seven minutes, but I have only obtained two observations since Jupiter has been visible as a morning star, and neither of these was very satisfactory.