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JOHN KEPLER.

JOHN KEPLER, the celebrated astronomer, whose labours heralded and partly contributed to the discoveries of our immortal Newton, was born at Weil, in the duchy of Wirtemberg, on the 27th of December, 1571. His father, Henry Kepler, was an officer in the pay of the Duke of Wirtemberg, and distinguished himself in the war in Flanders; his mother's maiden name was Catherine Guldenmann. Having imprudently become security for a person, who absconded, the warrior was compelled to part with all he had in order to discharge the obligations under which he had placed himself, and was fain to content himself with the humble position of a tavern-keeper at Elmendingen. This reverse rendered it necessary to remove young Kepler from school, and employ him at home. Such, however, was the extraordinary precocity of the youth, that when eleven years old he was admitted to the convent-school of Maulbronn, and educated there at the expense of the Duke of Wirtemberg. Here he

number of very ingenious conjectures with reference to the number, distances, and periods of the planetary orbs. Like the great Adams and his French rival, Leverrier, though not under the guidance of equally scientific principles—he presumed upon the existence of planets not yet known, and declared that the only reason why they had not been discovered, was the imperfection of the optical instruments employed in making observations. The boldness of his creative genius, as displayed in this work, struck Tycho Brahe with astonishment, and led him to invite Kepler to visit him—an invitation, however, which the latter did not then think proper to accept, because he was aware the illustrious mathematician held a doctrine directly opposed to his own.

About this time Kepler married a lady of noble family, Barbara Muller von Muhleckh, who was now a widow for the second time, though only twenty-four years of age. The union was a source of difficulty and embarrassment, which,



PORTRAIT OF JOHN KEPLER.

pursued his studies with untiring assiduity, in spite of constitutional weakness and domestic troubles, and at the age of twenty took his master's degree, ranking second at the examination. Shortly afterwards, he was appointed astronomical lecturer at Grätz, in Styria, not so much in accordance with any wish of his own—for he had not yet, he tells us, devoted any great attention to the study of astronomy—as out of deference to the authoritative dictates of his tutors.

Theology had occupied most of his thoughts from the time of taking his degree, and some of his compositions on that science attracted a good deal of attention. Now, however, he began to study astronomy with even greater interest and more decided success. The prevalent notions on astronomy were far from satisfying his penetrating mind. With a view to their correction, he published his "Mysterium Cosmographicum," in 1596, which was his first work, and formed a worthy prelude to those which followed. In this he put forth a

with the religious dissensions in Styria, led to his removal to Hungary. Here, during an interval of three years, he published several minor works, including a treatise on the magnet. Tycho Brahe, who still watched his progress with deep interest, once more endeavoured to attract him near him. This eminent philosopher had been forced to leave Uranienbourg for the asylum which Rodolph the Second, Emperor of Bohemia, offered him in Bohemia, and promised to procure Kepler the post of mathematician to the court, if he would come and reside there. Kepler, having learnt that Tycho Brahe was making astronomical observations of great value at Benach, went to visit him in the year 1600, and was most kindly received; but a serious indisposition, which lasted seven or eight months, prevented him from entering upon the duties of his office, as imperial mathematician, till the following year. The object of his appointment was, that he might assist Tycho Brahe in the formation of new astronomical

tables, to be called the Rudolphine Tables, after the emperor, who promised to bear all the expense, and liberally reward him. Circumstances, however, prevented the fulfilment of this promise. Kepler's salary was not regularly paid, and besides this, the employment was not exactly to his taste. He was involved in pecuniary difficulties, and even driven to eke out a subsistence by casting people's nativities. His impetuous disposition brought him into frequent collision with Tycho Brahe, his great benefactor. He sighed for his liberty. "Rodolph II.," said he to his friend, "is more of an astrologer than an astronomer. To satisfy him, I am obliged to waste my time in making almanacks for him." This was the way in which he spoke of the calendar which he assisted Tycho Brahe in preparing, and which had the misfortune to be burnt by the nobles of Styria, in 1621, because Kepler had given precedence in it to the nobles of Austria. The prefaces to several works which he issued at this period bear evidence of the pecuniary embarrassment which he experienced. Besides having to contend with the irregularity of payment to which we have already alluded, he had a numerous family to support, and, on the death of Tycho Brahe, undertook the charge of his also. In his perplexity, he applied to the landgrave of Hesse, who kindly rendered him valuable pecuniary and other assistance. In a preface addressed to the emperor, in 1618, he acknowledges the receipt of 4,000 pieces of silver; and it is impossible to read his remarks without a painful impression.

Kepler's great work on "The Motion of Mars," which forms a sort of stepping-stone from Copernicus to Newton, was published in the year 1609. After confuting the prevalent notions upon gravity, he distinctly asserts that the attraction of the moon operates upon the earth, and amid a multitude of errors throws out here and there other happy guesses at truth. The three great principles which Kepler is immortalised for having discovered, and which are well known under the name of "Kepler's Laws," are, that the planets move in elliptical orbits, that they describe equal areas in equal times, and that the squares of their periodic times are proportional to their mean distances from the sun. He did not succeed in establishing the last till twelve years after the other two, and then more by lucky conjecture than sound philosophical deduction. The labour he underwent before he could arrive at the first was immense. Starting with the assumption that the planetary orbits were of an oval form, he was disappointed to find that his calculations failed to demonstrate it. "All my theory, therefore," cried he, "has vanished into smoke." He began his work again; the arithmetical operations in which he engaged filled more than twenty-six pages; he failed every time he renewed the attempt. His vexation at this disappointment nearly drove him mad. No less than sixty-nine times did he renew his efforts; but the seventieth time he obtained the desired result. His joy was now unbounded. He surrounded figures of ellipses with symbolical designs. Ordinary language was insufficient to express all he felt; his enthusiasm could only find full scope in mystical symbols. Another discovery of Kepler's was the proper method according to which the glasses of a telescope should be combined and arranged; but he made no practical application of his theory. To enumerate all his published works would exceed our limits and only weary the reader. It is sufficient to say they were very numerous, some voluminous, and all remarkable. Kepler was the precursor, and in some degree the father, of the seventeenth century—that age which was rendered illustrious by the names of Newton, Descartes, Pascal, and others, who brought about a great reformation in science and general knowledge.

Sir Henry Wotton, the English ambassador, made an attempt, in 1620, to persuade Kepler to visit England, and held out a prospect of relief from the pecuniary embarrassment in which he was then involved; but he could not succeed. After appealing for assistance to various governments, Kepler at length completed the Rudolphine Tables in 1627. He was on the point of publishing a translation of a work of Plutarch, when he was compelled to go to Ratisbon for the arrears of

his salary. The fatigue of travelling, together with the annoyance he felt, brought on a fever, of which he died on November 5th, 1630, at the age of fifty-nine. He was buried in the churchyard of St. Peter's at Ratisbon. A brief inscription, which does not now exist, was placed upon his tombstone; and in 1808 a monument was erected to his memory under the auspices of the prince primate, Charles Theodore of Halberg. It is a temple situated in the Botanical Garden, not many yards from the spot where his remains lie. His bust in marble occupies the middle of the building, and stands on a pedestal, the bas-reliefs of which represent the genius of Kepler drawing aside the veil which conceals Urania. The goddess holds a telescope in one hand, and in the other a roll, on which the eclipse of Mars is delineated.

LUBECK AND THE HANSEATIC LEAGUE.

IN those middle ages, towards which the heart of young England so passionately yearns, men who would not fight or steal, men who would not live by plunder or pay, found themselves in a very disagreeable position. They were looked on with contempt. Big, blustering barons thought them very fair objects of attack; consequently, those who wished to live honestly, to sell and get again, were compelled to unite together for their own protection. It was true then, as now, that union is strength; and in order that they might not be deprived of the rich goods they brought from Italy for the supply of the north of Europe, the merchants of Hamburg and Lubeck joined in an association—the Hanseatic League—which ultimately became the proud and powerful rival of kings and emperors in arts and arms.

The precise date of the Hanseatic League is uncertain. In 1241 the treaty was formed between Lubeck and Hamburg for clearing the road of pirates and robbers, between the Elbe and the Trave, and the river from Hamburg to its mouth, of the same nuisances; but, before that time, Lubeck had formed an alliance with some of the Baltic towns for the same purposes. It was a standing rule of the Hanseatic League, that no cities should be admitted into the confederacy but such as were either situated on the sea, or on some navigable river adjoining. Another standing rule was, not to admit any cities into their league which did not keep the key of their own gates, and did not exercise civil jurisdiction themselves, though they might in other respects acknowledge some superior lord or prince; this prince, however, was compelled to take an oath to preserve their privileges entire. For a protector, they chose the Grand Master of the Teutonic Knights, who had settled in Bremen, and whose government was, in some respects, similar to their own. In process of time many other cities joined the league; their number at one time was upwards of eighty. They were divided into four classes, the chief of which were—Lubeck, Cologne, Brunswick, and Dantzic; at a latter time especially, Bruges, in Flanders, became one of their most famous towns, from which the south of Europe was supplied with the hemp, flax, timber, &c., of the north. In those days, Dr. Anderson tells us, the direct voyage in one and the same summer, between the Baltic and the Mediterranean seas and back again, being thought hazardous and difficult—the mariner's compass not being yet known—a middle or half-way station or port became very desirable, to which traders of both seas might bring their respective merchandise in summer; viz., the naval stores of the north, and the spices, drugs, fruits, cottons, of the Levant and Spain, and Italy, by the ships of Venice, Florence, Pisa, Geneva, &c., and the vines of France, there to be lodged as a market for the reciprocal supply of the rest of Europe. The trade of the Hanse towns with England commenced in 1266, where they were permitted to have a factory, called the Steelyard, situated somewhere between Thames-street and the river. After three years of war, a peace was concluded between the Hanse towns and Edward IV., from which we may conclude, that the naval strength of the English was