afterwards utilized in 1851 by Humboldt in the third volume of his *Kosmos.* The periodicity of sun-spots is now fully recog- nized (see Sun); and to Schwabe is thus due the credit of one of the most important discoveries in astronomy.

See H. H. Turner, *Astronomical Discovery* (1904).

SCHWALBACH, or Langenschwalbach, a favourite German health resort, fin the Prussian province of Hesse-Nassau, pleasantly situated in a deep valley, near the junction of the Schwalbach with the Aar, 12 m. N.W. from Wiesbaden, on the railway Dotzheim-Dietz. Permanent population (1905) 2836. Besides a large kursaal, the town has four churches, two Evangelical, a Roman Catholic and an English, a syna- gogue and several schools. There are eight springs, which are largely impregnated in varying proportions with iron and carbonic acid, and are used both for drinking and bathing. They are especially efficacious in feminine disorders, and the greater number of visitors (about 6000 annually) are ladies. The public grounds are prettily laid out and there are numerous fashionable hotels.

See Frickhöffer, *Die Eisenquellen zu Schwalbach* (2nd ed., Schwab bach, 1888), and A. Genth, *Geschichte des Kurortes Schwalbach* (3rd ed., Wiesbaden, 1884).

SCHWANN, THEODOR (1810-1882), German physiologist, was born at Neuss in Rhenish Prussia on the 7th of December 1810. His father was a man of great mechanical talent; at first a goldsmith, he afterwards founded an important printing establishment. Schwann inherited his father’s tastes, and the leisure of his boyhood was largely spent in constructing little machines of all kinds. He studied at the Jesuits’ college in Cologne and afterwards at Bonn, where he met Johannes Müller, in whose physiological experiments he soon came to assist. He next went to Würzburg to continue his medical studies, and thence to Berlin to graduate in 1834. Here he again met Müller, who had been meanwhile translated to Berlin, and who finally persuaded him to enter on a scientific career and appointed him assistant at the anatomical museum. Schwann in 1838 was called to the chair of anatomy at the Roman Catholic university of Louvain, where he remained nine years. In 1847 he went as professor to Liége, where he remained till his death on the 11th of January 1882. He was of a peculiarly gentle and amiable character, and remained a devout Catholic throughout his life. It was during the four years spent under the influence of Müller at Berlin that all Schwann’s really valuable work was done. Müller was at this time preparing his great book on physiology, and Schwann assisted him in the experi- mental work required. His attention being thus directed to the nervous and muscular tissues, besides making such histo­logical discoveries as that of the envelope of the nerve-fibres which now bears his name, he initiated those researches in muscular contractility since so elaborately worked out by Du Bois Reymond and others. He was thus the first of Müller’s pupils who broke with the traditional vitalism and worked towards a physico-chemical explanation of life. Müller also directed his attention to the process of digestion, which Schwann showed to depend essentially on the presence of a ferment called by him pepsin. Schwann also examined the question of spontaneous generation, which he greatly aided to disprove, and in the course of his experiments discovered the organic nature of yeast. In fact the whole germ theory of Pasteur, as well as its antiseptic applications by Lister, is traceable to his influence. Once when he was dining with Schleiden in 1837, the conversation turned on the nuclei of vegetable cells. Schwann remembered having seen similar structures in the cells of the notochord (as had been shown by Müller) and instantly realized the importance of connecting the two phenomena. The resemblance was confirmed without delay by both observers, and the results soon appeared in his famous *Microscopic Investigations on the Accordance in the Structure and Growth of Plants and Animals* (Berlin, 1839; trans. Syden­ham Society, 1847). The cell theory was thus definitely con­stituted. In the course of his verifications of the cell theory, in which he traversed the whole field of histology, he proved

the cellular origin and development of the most highly differ- entiated tissues, nails, feathers, enamels, &c. His generaliza­tion became the foundation of modern histology, and in the hands of Rudolf Virchow (whose cellular pathology was an inevitable deduction from Schwann) afforded the means of placing modern pathology on a truly scientific basis.

An excellent account of Schwann’s life and work is that by Léon Frédéricq (Liége, 1884).

SCHWANTHALER, LUDWIG MICHAEL (1802-1848), German sculptor, was born in Munich on the 26th of August 1802. His family had been sculptors in Tirol for three centuries; young Ludwig received his earliest lessons from his father, and the father had been instructed by the grandfather. The last to bear the name was Xaver, who worked in his cousin Ludwig’s studio and survived till 1854. For successive generations the family lived by the carving of busts and sepulchral monuments, and from the condition of mechanics rose to that of artists. From the Munich gymnasium Schwanthaler passed as a student to the Munich academy; at first he purposed to be a painter, but afterwards reverted to the plastic arts of his ancestors. His talents received timely encouragement by a commission for an elaborate silver service for the king’s table. Cornelius also befriended him; the great painter was occupied on designs for the decoration in fresco of the newly erected Glyptothek, and at his suggestion Schwanthaler was employed on the sculp- ture within the halls. Thus arose between painting, sculpture, and architecture that union and mutual support which characterized the revival of the arts in Bavaria. Schwanthaler in 1826 went to Italy as a pensioner of the king, and on a second visit in 1832 Thorwaldsen gave him kindly help. His skill was so developed that on his return he was able to meet the extra- ordinary demand for sculpture consequent on King Ludwig’s passion for building new palaces, churches, galleries and museums, and he became the fellow-worker of the architects Klenze, Gartner and Ohlmüller, and of the painters Cornelius, Schnorr and Hess. Owing to the magnitude and multitude of the plastic products they turned out, over-pressure and haste in design and workmanship brought down the quality of the art. The works of Schwanthaler in Munich are so many and miscellaneous that they can only be briefly indicated. The new palace is peopled with his statues: the throne-room has twelve imposing gilt bronze figures 1o ft. high; the same palace is also enriched with a frieze and with sundry other decorations modelled and painted from his drawings. The sculptor, like his contemporary painters, received help from trained pupils. The same prolific artist also furnished the old Pinakothek with twenty-five marbles, commemorative of as many great painters; likewise he supplied a composition for the pediment of the exhibition building facing the Glyptothek, and executed sundry figures for the public library and the hall of the marshals. Sacred art lay outside his ordinary routine, yet in the churches of St Ludwig and St Mariahilf he gave proof of the widest versatility. The Ruhmes- halle afforded further gauge of unexampled power of production ; here alone is work which, if adequately studied, might have occupied a lifetime; ninety-two metopes, and, conspicuously, the colossal but feeble figure of Bavaria, 6o ft. high, rank among the boldest experiments. A short life of forty-six years did not permit serious undertakings beyond the Bavarian capital, yet time was found for the groups within the north pediment of the Walhalla, Ratisbon, and also for numerous portrait statues, including those of Mozart, Jean Paul Richter, Goethe and Shakespeare. Schwanthaler died at Munich in 1848, and left by will to the Munich academy all his models and studies, which now form the Schwanthaler Museum.

**SCHWARTZE, TERESA (1852-** ), Dutch portrait painter,

was born at Amsterdam, the daughter of Johan Georg Schwartze (1814-1874), from whom she received her first training, before studying for a year under Gabriel Max and Franz von Lenbach in Munich. In 1879 she went to Paris to continue her studies under Jean Jacques Henner. Her portraits are remarkable for excellent character drawing, breadth and vigour of handling and rich quality of pigment. She is one of the few women painters