are soluble in water, their solutions having an acid reaction and an astringent taste; the solutions are coloured dark blue or green by ferrous salts, a property utilized in the manufacture of ink *(q.v.).* Their chemistry is little known. Some appear to be glucosides of gallic acid, since they yield this acid and a sugar on hydrolysis, *e.g.* oak tannin; whilst others yield proto- catechuic acid and phloroglucin, *e.g.* moringa-tannin; common tannin, however, is a digallic acid.

Common tannin, or tannic acid, C14H10O9∙2H2O, occurs to the extent of 50% in gall-nuts, and also in tea, sumach and in other plants. It may be obtained by extracting powdered gall-nuts with a mixture of ether and alcohol, whereupon the tannin is taken up in the lower layer, which on separation and evaporation yields the acid. When pure the acid forms a colourless, amorphous mass, very soluble in water, less so in alcohol, and practically insoluble in ether. Common salt precipitates it from aqueous solutions. It forms a penta-acetate. It may be obtained artificially by heating gallic acid with phosphorus oxychloride or dilute arsenic acid (cf. P. Biginelli, *Gazetta,* 1909, 39, ii. pp. 268 *et seq.)∙,* and con­versely on boiling with dilute acids or alkalis it takes up a molecule of water and yields two molecules of gallic acid, C7H6O5. It is optically active—a fact taken account of in J. Dekker’s formula *(Ber., 1906,* 39, p. 2497). The chemistry has also been investigated by Μ. Nierenstein and ,L. F. Iljin (see papers in the *Ber.,* 1908, *et seq.).*

The tannin of oak, C19H16O10, which is found, mixed with gallic acid, ellagic acid and quercite, in oak bark, is a red powder; its aqueous solution is coloured dark blue by ferric chloride, and boiling with dilute sulphuric acid gives oak red or phlobaphene. The tannin of coffee, C30H18O10, found in coffee beans, is not pre­cipitated from its solutions by gelatin. Hydrolysis by alkaline solutions gives a sugar and caffeic acid; whilst fusion with potassium hydroxide gives protocatechuic acid. Moringa-tannin or maclurin, C13H10O6·H2O, found in *Morus tinctoria,* hydrolyses on fusion with caustic potash to phloroglucin and protocatechuic acid. Catechu-tannin occurs in the extract of *Mimosa catechu;* and kino-tannin is the chief ingredient of kino (*q.v.*).

Medicine.—Tannic acid is official in both the British and United States Pharmacopoeias. It is incompatible with mineral acids, alkalis, salts of iron, antimony, lead and silver, alkaloids and gelatin. The British pharmacopoeial preparations are (1) *glycerinum. acidi tannici∙,* (2) *Suppositoria acidi tannici;* (3) *trockiscus acidi tannici.* The United States also has a *collodium stypticum* and an ointment. From tannic acid is also made *gallic acid,* which re­sembles tannic acid but has no astringent taste. When applied to broken skin or exposed surfaces it coagulates the albumen in the discharges, forming a protecting layer or coat. It is moreover an astringent to the tissues, hindering the further discharge of fluid. It is a powerful local haemostatic, but it only checks haemorrhage when brought directly in contact with the bleeding point. It is used in the treatment of haemoptysis in the form of a fine spray, or taken internally it will check gastric haemorrhage. In large doses, however, it greatly disorders the digestion. In the intestine tannic acid controls intestinal bleeding, acting as a power­ful astringent and causing constipation; for this reason it has been recommended to check diarrhoea.

Tannic acid is largely used in the treatment of various ulcers, sores and moist eruptions. The glycerin is used in tonsillitis and the lozenges in pharyngitis. For bleeding haemorrhoids tannic acid suppositories are useful, or tannic acid can be dusted on directly. The collodium stypticum is a valuable external remedy. Tannic acid is absorbed as gallic acid into the blood and eliminated as gallic and pyrogallic acids, darkening the urine. Gallic acid does not coagulate albumen when used externally. It has been used internally in haemoptysis and haematuria. Combined with opium it is an efficient remedy in *diabetes insipidus.*

**TANN-RATHSAMHAUSEN, LUDWIG SAMSON ARTHUR,** Freiherr von und zu der (1815-1881), Bavarian general, was born at Darmstadt on the 18th of June 1815, the day of Waterloo. He was descended from the old family of von der Tann, which had representatives in Bavaria, Alsace and the Rhine countries, and assumed his mother’s name (she being the daughter of an Alsatian, Freiherr von Rathsamhausen) in 1868 by licence of the king of Bavaria. Ludwig, the first king of Bavaria, stood sponsor for the child, who received his name and in addition that of Arthur, in honour of the duke of Wellington. He received a careful education, and in 1827 became a page at the Bavarian court, where a great future was predicted for him. Entering the artillery in 1833, he was after some years placed on the general staff. He attended the manoeuvres of the Austrian army in Italy under Radetzky *(q.v.)* and, in the spirit of adventure, joined a French military expedition operating in Algiers against the Tunisian frontier. On his return he became a close personal friend of the Crown Prince Maximilian Joseph (afterwards King Maximilian). In 1848 he was made a major, and in that year he distinguished himself greatly as the leader of a Schleswig-Holstein light corps in the Danish war. At the close of the first campaign he was given the order of the Red Eagle by the king of Prussia, and his own sovereign gave him the military order of Max-Joseph without his asking for it, and also made him a lieutenant-colonel. In 1849 he served as chief of staff to the Bavarian contingent at the front, and distinguished himself at the lines of Düppel, after which he visited Haynau’s headquarters in the Hungarian war, and returned to Schleswig-Holstein to serve as v. Willisen’s chief of staff in the Idstedt campaign. Then came the threat of war between Prussia and Austria, and von der Tann was recalled to Bavaria. But the affair ended with the “ surrender of Olmütz,” and he saw no further active service until 1866, rising in the usual way of promotion to colonel (1851), major- general (1855), and lieutenant-general (1861). In the earlier years of this period he was the aide-de-camp and constant com­panion of the king. In the war of 1866 he was chief of the staff to Prince Charles of Bavaria, who commanded the South German contingents. The almost entirely unfortunate issue of the military operations led to his being vehemently attacked in the press, but the unreadiness and unequal efficiency of the troops and the general lack of interest in the war on the part of the soldiers foredoomed the South Germans to failure in any case. He continued to enjoy the favour of the king and received promotion to the rank of general of infantry (1869), but the bitterness of his disappointment of 1866 never left him. He was grey-haired at forty-two, and his health was impaired. In 1869 von der Tann-Rathsamhausen, as he was now called, was appointed commander of the I. Bavarian corps. This corps he commanded in the Franco-German War, and therein he retrieved his place as one of the foremost of German soldiers. His gallantry was conspicuous at Wörth and Sedan. Transferred in the autumn to an independent command on the Loire, he conducted the operations against d’Aurelle de Paladines, at first with marked success, and forced the surrender of Orleans. He had, however, at Coulmiers to give way before a numerically larger French force; but reinforced, he fought several successful engagements under the Grand Duke of Mecklenburg near Orleans. On the termination of the war he was reappointed commander-in-chief of the I. Bavarian corps, a post which he held until his death at Meran on the 26th of April 1881. He had the grand cross of the Bavarian military orders, and the first class of the Iron Cross and the *pour le mérite* from the king of Prussia. In 1878 the emperor named von der Tann chief of a Prussian infantry regiment, decreed him a grant, and named one of the new Strassburg forts after him.

See Life by Lieutenant-colonel Hugo von Helvig in *Mil*. *Wochen­blatt,* Supplement, 1882.

TANSA, a small river in Salsett island, in the Thana district of Bombay, which provides the city of Bombay with its water- supply. It is embanked by one of the largest masonry dams in the world, built in 1892. The embankment is nearly 2 m. long, 118 ft. high, and 110 ft. thick at the base.

**TANTA,** a town of Lower Egypt, in a central position nearly midway between the two main branches of the Nile, and converging-point of several railways traversing the Delta in all directions. It has a population (1907) of 54,437, is the capital of the rich province of Gharbia, and is noted for its fairs and Moslem festivals, which are held three times a year in honour of Seyyid el-Bedawi, and are sometimes attended by 200,000 pilgrims and traders. There are a large railway station, a very fine mosque (restored), and a palace of the khedive. Seyyid el-Bedawi, who lived in the 13th century A.D., was a native of Fez who, after a pilgrimage to Mecca, settled in Tanta. He is one of the most popular saints in Egypt.

**TANTALUM** [symbol Ta, atomic weight 181∙0 (O=16)], a metallic chemical element, sparingly distributed in nature and then almost invariably associated with columbium. Its history